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ICT in Business and the Public Sector

Implementation of agile roles in Practice: Perspectives from job design theory

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MASTER'S THESIS

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Abstract

Introduction Unlike traditional methods, agile methods prioritise flexible processes over detailed plans and heavy documentation. Since agile methods, such as Scrum, Kanban, and Extreme Programming, have been successful at the team level, large organisations want to implement them at the enterprise level. This will impact multiple organisational layers, including teams, programs, and portfolios. Various scaling agile frameworks were suggested to solve problems connected with team size, customer involvement, and project limitations. However, adopting agile methods at a larger scale involves new issues, such as implementing and defining the agile roles such as Scrum Master, Product Owner, Product Manager, Release Train Engineer, and Line Manager. This study uses the job design theory to gain a better understanding of the agile roles in practice. This study aims to collect empirical data that can fill the research gap pertaining to the relationship between the five roles and the job design theory. The findings of this study will assist organisations in identifying the job requirements of individuals assigned to these roles, enabling them to configure the roles and their interactions more effectively.

Methods A quantitative approach, specifically a survey, was chosen to collect data for this study. Multiple versions of the survey were tested and subjected to expert input to improve survey quality. This resulted in modified questions to make sure all participants could answer. The survey consisted of four parts. The first part collected descriptive information, the second part collected data on five motivational characteristics using a five-point Likert scale, the third part gathered information on attitudinal and role perception outcomes using a seven-point Likert scale, and the last part gathered data on team performance using a five-point Likert scale. LinkedIn and email were utilised to distribute the survey.

Results Multiple statistical analyses have been conducted on the gathered data. The results indicated that all the Agile roles have their own responsibilities, while some are shared. Additionally, there is little to no pay difference between roles on the same level (e.g., team and program levels). The delivery responsibility lies with the development team, while the Product Owner remains accountable.

Conclusion The job design theory was used to get a better understanding of the agile roles in practice, and the findings show that the conceptual model successfully diagnosed the existing jobs and related attitudinal and role perception outcomes in practice. The data outlined the different individual responsibilities of the agile roles in practice, strengthening the Framework Guides' definition of these roles. However, the data also showed that responsibilities are being shared, where some of these lead to higher motivation. Organisations might customise the definition of these roles according to their organisational environment to fit their unique organisational context and the team's needs.

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1 Introduction

Agile methods like Extreme Programming, Kanban, and Scrum have greatly improved the practice of software development (Beck, 2000; Schwaber et al., 2017). These approaches prioritise flexibility, teamwork, and customer engagement, leading to significant progress in the field (Dingsoyr et al., 2014; Kettunen, 2007; Fowler et al., 2001). These approaches involve small, co-located, and self-organising teams that work alongside the business customer in a single-project environment (Kettunen, 2007; Uludag et al., 2017). They aim to maximise customer value and improve software product quality through frequent feedback loops and rapid iterations. Since agile methods have been successful at the team level, large organisations want to implement them at the enterprise level (Alqudah et al., 2016). This will impact multiple organisational layers, including teams, programs, and portfolios (Uludag et al., 2017; Stettina et al., 2021). Many scaling agile frameworks, e.g., the Scaled Agile Framework (SAFe), Spotify, and Large-Scale Scrum (LeSS), were suggested to solve problems linked with team size, customer involvement, and project constraints (Dikert et al., 2016; Uludag et al., 2017, 2018; Stettina et al., 2021). SAFe, for instance, offers several benefits, including happier and more motivated employees, faster time-to-market, increased productivity, reduced defects, improved product quality, more organised and planned work, and greater autonomy for development teams (Stettina et al., 2021).

However, the adoption of agile methods at a larger scale involves new challenges, such as implementing and defining the agile roles such as Scrum Master, Product Owner, Product Manager, Release Train Engineer, and Line Manager (Dikert et al., 2016; Gustavsson, 2017; Uludag et al., 2018; Remta et al., 2021). These roles are crucial because they have essential tasks or jobs to perform to deliver value agilely and successfully. It is essential to implement these roles with the right tasks and skills to lead to employee motivation and satisfaction to impact work performance (Gustavsson, 2017; (Hackman et al., 1975; Morgeson et al., 2006). Additionally, it is essential to understand how the Scrum Master, Product Owner, Product Manager, Release Train Engineer, and Line Manager roles are implemented in organisations transforming into scaled agile because they impact organisational performance (Gustavsson, 2017, 2018, 2019). These roles might perform poorly without favourable attitudinal outcomes (i.e. Internal work motivation and Satisfaction), resulting in organisational failure (Gustavsson, 2017; Uludag et al., 2019; Hackman et al., 1975; Morgeson et al., 2006). It is essential to have clarity to help organisations configure the roles and their interactions properly. Also, the effectiveness of jobs depends mainly on having suitable individuals in the right roles at the right time. Thus, to make the adoption successful, it is essential that agile roles in the scaled agile framework are well-defined and implemented (Dikert et al., 2016; Gustavsson, 2017; Uludag et al., 2019).

They will be examined from a Human Resource Management (HRM) perspective to understand these agile roles better. Effective organisations recognise that HRM practices are a critical factor directly

impacting employee performance (Hassan, 2016; Maaitah et al., 2018). Job design is a common focus of research in the field of HRM (Foss et al., 2009). Job design indicates that making a task or job more interesting is crucial to an employee's motivation to impact personal and work performance. Job design has been one of the most productive instruments for improving employee performance (Zareen et al., 2013). It can be explained as changing the details and processes of a job to increase an individual's satisfaction, motivation, and productivity. Studies have shown that workplace design is essential for individual, group, and organisational outcomes (Morgeson et al., 2006). Due to the growing importance of job design, many researchers have studied and developed numerous studies concentrating on the key elements of jobs.

1.1 Problem Definition and Research Question

Considering the increase of scaled agile adoption and modification of Agile, it is obvious that the primary idea of the methods and roles had to evolve as well (Remta et al., 2021). Hence, organisations transforming to scaled agile struggle to implement agile roles like Product Owner (PO), Scrum Master (SM), Product Manager (PM), Release Train Engineer (RTE), and Line Manager (LM) because they fail to understand, for example, which levels to hire, what skills these roles need, or which tasks suit them well (Dikert et al., 2016; Gustavsson, 2017; Uludag et al., 2017, 2019; Remta et al., 2021). The agile frameworks have been around for some time, but they do not provide clear guidance on effectively implementing these roles.

Therefore, the challenge of hiring the right people can emerge from an insufficient understanding of the specifics of the role in scaling agile (Gustavsson, 2017; Uludag et al., 2019; Remta et al., 2021). Leading from this, the research question that will be addressed in this study is:

"How are the Scrum Master, Product Owner, Product Manager, Release Train Engineer, and Line Manager roles implemented in practice, and how does it impact their personal and work behaviour?"

To help answer the research question, some guiding questions will be addressed in the discussion section, such as

- Should the Scrum Master and Product Owner, Product Manager and Release Train Engineer roles be separated?
- What are the pay scale recommendations for these roles?
- Who should be responsible for delivering the sprint results, and who is accountable for those results?

1.2 Aim of the Research

It is essential to understand how the Scrum Master, Product Owner, Product Manager, Release Train Engineer, and line manager roles are implemented in practice by organisations transforming to scaled agile frameworks and what the impact is on individual satisfaction, motivation, and team performance because they have important tasks to perform to deliver value agilely and successfully.

The job design theory is used as a lens/tool to understand better what is happening with the agile roles in practice. This research aims to provide empirical data to fill the research gap regarding the relationship between the five roles and the job design theory. Furthermore, the findings of this study will help organisations recognise the job requirements of individuals assigned to these roles and, thus, help them in configuring the roles and their interactions more effectively.

1.3 Scope of the Research

To ensure that the study is focused, clear boundaries or scope needs to be established.
Agile methodology is primarily used in product and service development, particularly in IT. Hence, we will not be exploring its application outside of IT for this study. The Agile roles in this domain are relatively new and unexplored compared to traditional roles. Therefore, the focus will be on understanding the personal skills and perspectives required to excel in these roles. The primary focus is on the motivational/task characteristics of the job design theory to gain a better understanding of these roles and to understand what motivates these roles the most when implemented effectively and efficiently.

Subject	**In Scope**	**Out of Scope**
Domain	Agile Product and Service Development	Non-IT domains such as Law, Medicine, etc.
Roles	Agile Practitioners and Line Management	Non-Agile Practitioners, such as HR employees and managers, Finance employees, Marketing employees, etc.
Unit of Analysis	Mostly individual perspectives, such as responsibilities, jobs and outcomes	Organisational or Societal perspectives
Personal Skills	Teamwork, communication, autonomy in work, management practices	Technical skills such as good knowledge of C++, Payton, DevOps, data analysis, etc.
Job Design	Motivational/Task Characteristics	Knowledge Characteristics, Social Characteristics, and Contextual Characteristics.

Table 1 Research Scope

1.4 Structure of the Thesis

This paragraph will explain how this research paper is constructed

Chapter 1 introduces the research topics and explains the study's motivation, goals, and research question.

Chapter 2 focuses on background information and highlights what the literature says about agile and scaled agile, which agile roles are used in which frameworks, and their responsibilities. It also reviews the literature on job design approaches leading to individual motivation and satisfaction and various other outcomes.

Chapter 3 presents the conceptual model, which is partly based on existing literature on job design theory and expert input. All the measuring variables are defined in this paragraph.

Chapter 4 presents the methodology that has been applied to collect the data. This paragraph describes the survey design and measures that will be applied. Since job design theorists designed a survey questionnaire to measure their model, an online survey method based on the job design theory will also be used in this research to collect data from professionals working in agile software development teams to get a deeper understanding of the roles in practice. The objective is to explore the job design of agile roles from a bigger perspective rather than per case. Data collection will be through a survey, which will be conducted online/internationally via LinkedIn and emailing organisations.

Chapter 5 focuses on data analyses, which are this study's descriptive and correlation results. for instance, who is responsible or accountable for the results of a team sprint, which responsibility lies with which agile role, pay scale differences between the roles, etc.

Chapter 6 will revisit and discuss the data and findings about the roles and indicate some possible constraints of this research.

Chapter 7 presents the conclusion and suggestions for future study.

2 Literature Review

This section contains background information on agile operating models and roles, where different frameworks are described with their respective roles and responsibilities of the agile roles in scaled agile frameworks. The job design theories of Herzberg, Campion, Hackman, and Morgeson are also described, along with their models and outcomes. Considering this background information, the allocation of responsibilities for each role will be examined in practice. Furthermore, the motivational characteristics associated with each role will be examined, and how these traits correspond to factors such as pay satisfaction, security satisfaction, social satisfaction, supervisory satisfaction, growth satisfaction, internal work motivation, and role conflict and ambiguity.

2.1 Agile Models and Roles

According to the paper of (Kumar et al., 2012), Agile Methodologies refer to software development methods that rely on iterative and incremental development. These approaches share four key characteristics: flexible planning, iterative and evolutionary development, quick and flexible reaction to change, and a strong emphasis on communication (Begel et al., 2007; Maher, 2009).

The term "agile" is now linked to various benefits such as enhanced quality, increased value, quicker time-to-market, better adaptability to change, and reduced development expenses (Stettina et al., 2021). Agile approaches offer a new level of flexibility that was not available before and are well-suited for creating complex products. The product is initially developed iteratively based on a specific vision. This approach provides flexibility and allows project members to gain knowledge during development, which can positively influence the product's development. This helps ensure that the final product meets the expectations of users and stakeholders (Fowler et al., 2001; Dyba et al., 2008).

Since businesses face difficulties in handling unpredictable competitive environments caused by fast-changing customer needs, regulatory modifications, and technological progress that can affect the company's success, detecting relevant changes and responding promptly and effectively is crucial for an organisation’s survival. To handle these various challenges, the development of the Agile Manifesto and numerous software development practices such as extreme programming (XP), kanban, and scrum have come into existence (Weill et al., 2015; Sherehiy et al., 2007; Kettunen, 2007).

2.1.1 Agile Models/Frameworks

Initially, individual teams used Agile methodology for software development. However, organisations are focused in extended agile methods, which include bigger teams distributed globally and inter-team coordination. Additionally, the impacts on different layers, such as teams, programs, and portfolios, as well as multiple business domains, such as HR, finance and sales (Stettina et al., 2021; Dyba et al., 2008). Since agile methods have been successful at the team level, big organisations want to implement them at the enterprise level (Uludag et al., 2017; Stettina et al., 2021; Dyba et al., 2008). The scaled agile frameworks aim to address challenges related to team size, customer involvement, and project restrictions by incorporating both Lean and Agile principles, making them suitable for larger organisations (Stettina et al., 2021; Ljung et al., 2019; Uludag et al., 2017; Ebert et al., 2017).

The history of agile at scale can be understood in four stages (Stettina et al., 2021):

1. *Team-level agile*: During the late 1990s, several frameworks and methods were developed to address the rising number of unsuccessful software development projects. The academic source stems from Takeuchi and Nonaka, whose product development game-inspired frameworks like Scrum and XP. Agile methods now exist to shorten feedback loops and align work with business needs.
2. *Cross-team and program-level agile*: Scrum was successful up to 2000, which led to the desire to implement larger initiatives agilely. However, Scrum was initially designed for projects with a team of 5-9 members. Organisations began testing with coordinating multiple agile teams to deliver larger initiatives. This led to the design of Scrum of Scrums. Other frameworks, such as Nexus, which restricts itself to 80 people, have been developed for smaller organisations.
3. *Enterprise agile*: An increasing adoption of Scrum in organisational settings has challenged existing roles and responsibilities. Scrum emphasis more collaboration among users, sponsors, and teams, sometimes creating conflicts with the standard organisational structures and workflow. For this reason, frameworks like the Scaled Agile Framework (SAFe), LeSS (Large-Scale Scrum), and the Spotify model emerged around 2010 to embed large-scale agile IT initiatives into enterprises.
4. *Business agility:* Since 2018, companies and framework creators have shifted their focus from IT-driven approaches to organisation-wide agility. Although the term has been present in academic literature for a while, it was only later that terms like agile finance, agile marketing, agile sales, and agile HR started to emerge.

Not all agile methods will be described, as the goal of this study is not to explain them. This study will only cover the most well-known methods from team to enterprise level, such as Scrum, Scaled Agile Framework (SAFe), Large Scale Scrum (LeSS), and Spotify.

2.1.1.1 Scrum

Scrum is one of the most favoured agile development frameworks due to its simplicity and versatility (Scrum Guide, Schwaber et al., 2020; Hron et al., 2018; Sachdeva, 2016). The Scrum Association has issued a Scrum Guide, which provides the official definition of the Scrum method. In 2016, Sachdeva described this framework in detail based on the published guide. Within the Scrum Team, Scrum defines three specific accountabilities: Developers, Product Owner, and Scrum Master. All the roles are essential for the Scrum process to function effectively. Scrum teams are self-governing and contain individuals with diverse professional backgrounds. Each team possesses all the necessary knowledge required to carry out the project, and therefore, the team does not need to rely on external input for the work. Scrum is an incremental and iterative agile software development framework for managing product development. In Scrum, the development process is divided into sprints that last up to four weeks. At the end of each sprint, a shippable product increment is delivered to the user. At the start of each new sprint, there is a meeting called sprint planning. During this meeting, the developers work alongside other stakeholders to choose the tasks to complete during the sprint. As per Scrum methodology, the product owner represents the customer. The requirements are documented as user stories and compiled in a product backlog based on their priority. The product backlog is a dynamic document that is constantly updated to reflect the evolving understanding of user needs. Scrum is intended for small, interdisciplinary teams consisting of roughly six to nine developers. One crucial aspect of a Scrum team is self-organisation, meaning the team has the power to determine the best strategies for accomplishing the sprint's goals. To ensure daily operations and compliance with the Scrum methodology, a Scrum master is necessary for every Scrum team. To maintain a quick pace of work, the team has daily stand-up meetings. During these meetings, each member informs the others about their progress and tasks for the day. Retrospectives are helpful for learning and take place after each sprint. They provide an opportunity to reflect on the work practices used during the sprint.

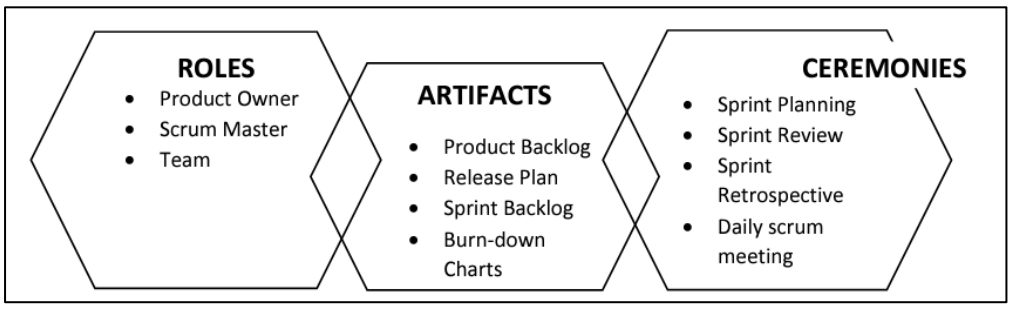


Figure 1 Scrum Framework

2.1.1.2 Scaled Agile Framework (SAFe)

Dean Leffingwell released SAFe in 2011, and the framework is now at version 6.0 (Scaled Agile Framework). SAFe is a framework that integrates lean and agile principles for large-scale projects. SAFe offers a structured approach to agile, making it an ideal choice for those shifting from a traditional environment, especially for large projects. Introducing agile practices into an organisation can be challenging due to the major cultural shift it requires. To address this, SAFe provides a structured approach that makes the transition more predictable while emphasising autonomy and decision-making for knowledge workers (Leffingwell, 2011; Uludag et al., 2017).

Companies have undergone varying degrees of transformation toward agility across different organisational layers, including teams, programs, and portfolios. SAFe covers all three layers, whereas other frameworks such as LeSS, Spotify, and business agility may not address them (Stettina et al., 2021).

This framework offers several benefits, including happier and more motivated employees, faster time-to-market, increased productivity, reduced defects, improved product quality, more organised and planned work, and greater autonomy for development teams (Stettina et al., 2021). Besides the original roles of Scrum, which are also recognised in SAFe, other roles that influence product development are defined, such as the product manager, RTE, and Line manager (Remta et al., 2021).

This framework has four levels of organisation: team, program, value stream, and portfolio. Each level combines agile and lean practices, manages its activities, and is connected with the other levels (Leffingwell, 2011; Ebert et al., 2017; Uludag et al., 2017; Ljung et al., 2019).

The team level is the foundation of SAFe and where all the value creation is done (Ljung et al., 2019; Scaled Agile Framework guide). At this level, a set of teams is responsible for developing User Stories based on items recognised at the Program level (Stettina et al., 2021). This level refers to the location of the Agile teams within an enterprise. These teams are self-organised and responsible for their work. An Agile team typically consists of a Product Owner (PO) who is responsible for determining what needs to be done, a Scrum Master (ScM) who focuses on the implementation and operation of servant leadership and a group of developers. The proposed working process is Scrum, but Kanban or XP can also be used. The team's work tasks are called "Stories", which the developers are in charge of completing. However, the responsibility of prioritizing tasks, accepting new ones and declaring them as completed once finished, lies with the PO.

The Program Level is made up of an Agile Release Train (ART) (Scaled Agile Framework Guide; Ljung et al., 2019; Uludag et al., 2017). Each ART comprises a set of teams, and multiple ARTs work

together to form a Solution Train. The three primary management roles at the program level are the Product Manager (responsible for determining what needs to be done), the System Architect/Engineer (responsible for determining how things should be done), and the Release Train Engineer (responsible for overseeing the execution and operation of servant leadership). To coordinate the POs, the additional role of RTE is prescribed (Gustavsson, 2018). Additionally, the product manager (PM) acts as the content authority for the ART and is accountable for identifying and prioritising the ART backlog.

At the value stream level, which is also known as the large solution level, a Solution Train is responsible for delivering Epics (Scaled Agile Framework guide; Ljung et al., 2019). An organisation can have multiple Solution Trains, each of which is managed by three key roles. The Solution Manager is responsible for defining what needs to be done, the Solution Architects/Engineers determine how it should be done, and the Solution Train Engineer ensures that the implementation and operation are carried out effectively while practising servant leadership.

On the portfolio level, long-period strategies and plans are set up for the enterprise, including lean budgeting, investing, and governing practices (Scaled Agile Framework Guide; Ljung et al., 2019; Uludag et al., 2017). Additionally, processes are specified, and value streams are optimised using lean practices, a sequence of steps to deliver value. These help executives and leaders recognise and prioritise epics, which are large plans the enterprise wants to perform and items that can be segmented at the program level and scheduled for ARTs. The motive is to organise the enterprise in a Lean-Agile way. To summarise, the portfolio management team implements strategic themes, breaks them into a backlog, and assigns them to appropriate program layers (Stettina et al., 2021).

Based on the scaling principle, the program layer is built on top of several underlying teams. On the other hand, portfolios are built on several programs and apply a different workflow, in which the programs within the portfolio may compete for resources (Stettina et al., 2021).

The SAFe framework prescribes using a release plan known as Product Increment (PI). Before starting a Program Increment (PI), the Agile Release Train (ART) holds a two-day PI planning event that all ART members attend. The purpose of this event is to present the objectives of the upcoming PI, allow teams to execute stories, and work on resolving dependencies with other teams. During the PI planning, the Scrum Master plays an active role by supporting their team (Scaled Agile Framework Guide; Ljung et al., 2019; Gustavsson, 2018).

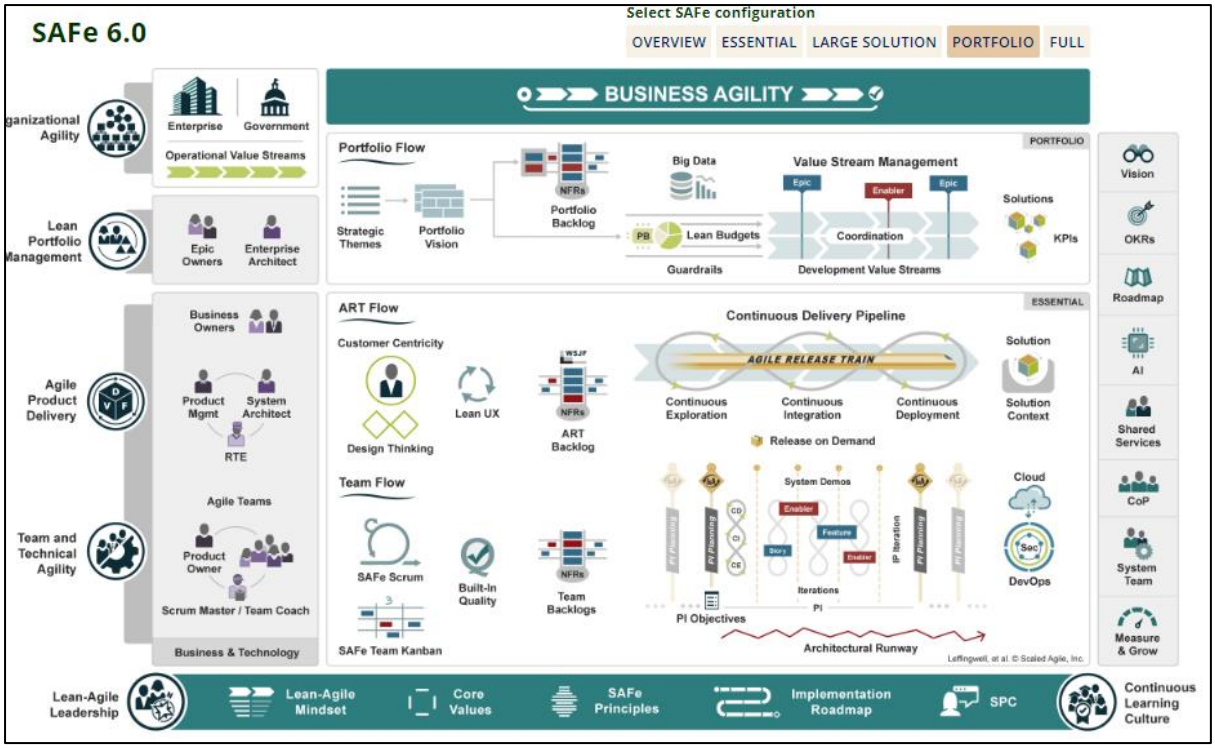


Figure 2 Scaled Agile Framework (SAFe)

2.1.1.3 Large Scale Scrum (LeSS)

The LeSS framework was introduced by Craig Larman and Bas Vodde in 2008 (Uludag et al., 2019; Almeida et al., 2022). It builds upon Scrum by incorporating scaling principles and guidelines while still staying true to Scrum's initial objectives. LeSS is a different approach to Scrum that involves making organisational changes. Its goal is to improve collaboration between many Scrum teams by appointing a product owner (PO) who is responsible for a central backlog and many teams. Teams coordinate using a process similar to Scrum, involving sprint planning and review. In the case of smaller products, all product members participate in the same planning and review. However, for larger products, only a representative from each team must attend the meetings. Even though LeSS focuses on principles, it includes four components (Larman et al., 2008):

Rules: The foundation of LeSS is defined by rules. Like Scrum, it emphasises the team structure, roles, product requirements, and development process.

Principles: The principles of LeSS offer guidance on implementing it in various enterprise settings.

Guides: This provides tips and best practices for adapting the rules and is a part of the experiments.

Experiments: Teams are encouraged to experiment, fail, and learn new ideas.

LeSS seeks to simplify a large and complex organisation. The LeSS framework allows for the implementation of Large-scale Scrum, which can accommodate up to eight teams consisting of a maximum of eight people each. (Larman et al., 2008; Uludag et al., 2019; Almeida et al., 2022).

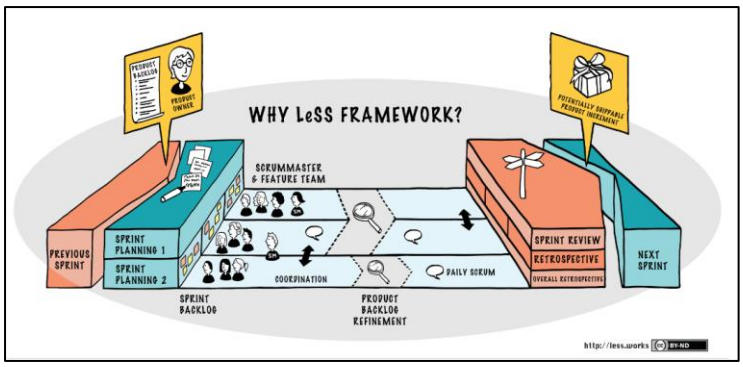


Figure 3 Large Scale Scrum Framework (LeSS)

2.1.1.4 Spotify

Spotify has established its own Agile culture and adapted Agile practices to suit a large-scale software program with over 300 team members spread across four cities (Salameh et al., 2021; Kniberg et al., 2012). At Spotify, the model for success involves creating autonomous and aligned squads. The company uses an adaptive structure and builds communities around it to achieve this. This structure is based on a two-dimensional matrix (vertical and horizontal), which encourages innovation. The communities of Squads and Tribes represent the vertical structure. A Squad functions similarly to a Scrum team. They sit together and possess all the required skills and tools to design, develop, test, and release a product to production. Being a self-organising team, they have the freedom to decide their preferred way of working. Some opt for Scrum sprints, some prefer Kanban, while some choose a combination of both methodologies. In a squad, a product owner prioritises the team's work but does not interfere with how they execute it. The product owners from various squads work together to keep a roadmap for Spotify's overall direction. Each product owner maintains a product backlog for their squad to match the roadmap. A squad also has access to an agile coach, who helps them progress and improve their working methods. The communities of Chapters and Guilds represent the horizontal structure. A tribe is a group of co-located squads with less than 100 people. Its purpose is to encourage collaboration and reduce dependencies between squads. In every Tribe, there exist Chapters that consist of individuals possessing similar skill sets and working in the same competency area. These small groups meet regularly to tackle problems within their area of expertise. They are the binding force that keeps the organisation united without compromising individual autonomy. While Chapters are situated within the same Tribe, there are extensive groups of individuals throughout the entire organisation, known as Guilds, who aspire to exchange knowledge and expertise across the organisation.

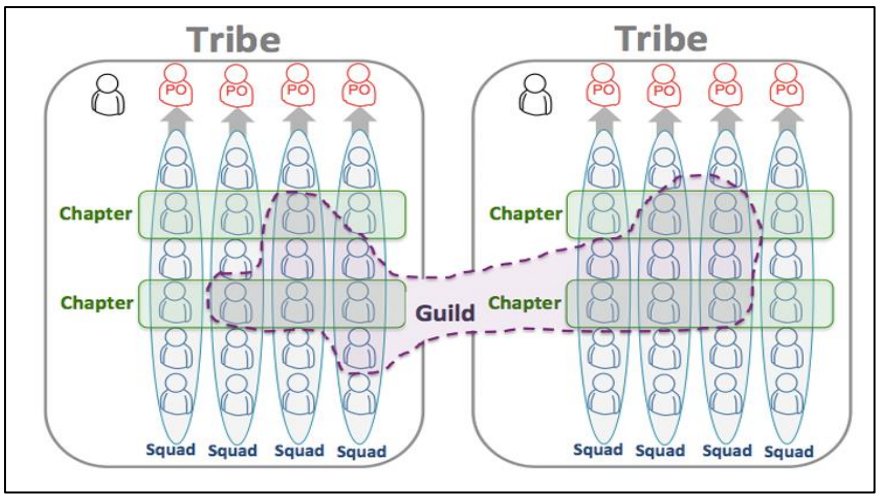


Figure 4 Spotify Framework

2.1.2 The Roles in the Scaled Agile Framework

In Agile Software Development, the individuals, interactions, knowledge, and skills are crucial to success (Cunha et al., 2024). Since humans are important in Agile Software Development, evaluating and predicting professionals' abilities can enhance individual performance and team productivity. Good understanding of Agile Software Development competencies is crucial for organisations to optimise human resources and achieve project success effectively. Identifying these competencies and capabilities can be a difficult task, but it is necessary for many project management tasks such as task allocation, team collaboration, and team formation. Measuring and predicting the capabilities of software engineers and teams is a challenge that agile software development needs to tackle in order to enhance individual performance, team efficiency, and project success.

It is essential to implement these roles with the right tasks and skills to lead to employee motivation to impact personal and work performance (Gustavsson, 2017; Hackman et al., 1975; Morgeson et al., 2006). It is essential to have clarity to guide organisations. Additionally, agile roles are important as they impact organisational performance.

Since staffing the right people with the right skills is an essential task of the HRM department, the effect of agile is huge for HR: hiring, learning and development, motivation, engagement, compensation, and performance. Agile for HR focuses on how HR can apply the agile mindset to different working methods within the team, group, or organisation (Ranasinghe et al., 2021).

According to the master thesis of Louis A. Krol, who performed an in-depth interview with experts in the agile and HR domain, there are at least ten challenged domains for HR, which are Talent, Culture Change, learning and development, Organizational Design, Career, Alignment, Performance, Knowledge, Employee Satisfaction, and IT Environment.

According to his research, the four domains that are challenged the most are talent (e.g., recruiting, right skills, job descriptions, role mapping, etc.), culture change (e.g., leadership styles and behaviour, collaboration, learning, resistance to change, employees, etc.), learning and development (e.g., onboarding, talent development, skill shape, talent enablement, etc.), and organisational design (e.g., organisational structure, employees, HR as discipline and department, etc.). This implies that organisations adopting agile methodologies have little knowledge of the right roles, skills, responsibilities, and hiring.

This section will outline the responsibilities of the following roles: Scrum Master, Product Owner, Team Member, Product Manager, Release Train Engineer, and Line Manager.

Agile roles in specific frameworks:

Frameworks Roles	**Scrum**	**SAFe**	**LeSS**	**Spotify**
Scrum Master	**X**	**x**	**x**	Agile coach
Product Owner	**X**	**x**	**x**	**x**
Team Member	**X**	**x**	**x**	Squads
Product Manager		**x**	Area Product Owner	**x**
RTE		**x**		Tribe lead
Line Manager		**x**		Chapter lead

Table 2 Agile Roles in Agile Frameworks

2.1.2.1 Scrum Master

The Scrum Master is in charge for executing Scrum as per the guidelines laid out in the Scrum Guide. To achieve this, they help everyone involved in the Scrum Team and the organisation to understand Scrum theory and practice (Schwaber et al., 2020; Noll et al., 2017; Bass, 2014). The Scrum Team's effectiveness is the responsibility of the Scrum Master, who must facilitate them with constant improvement within the Scrum framework. Scrum Masters are exceptional leaders who assist the Scrum Team and the larger organisation. The role of the Scrum Master is important in supporting the Scrum Team in many ways, including teaching team members self-management and cross-functionality, guiding the team to focus on creating valuable Increments, facilitating the elimination of obstacles that hinder the team's growth, and ensuring that all Scrum events take place within the timeframe and are productive and positive. The role of the Scrum Master is to assist the Product Owner in various ways, such as identifying effective ways to define the Product Goal and managing the Product Backlog efficiently. They also help the Scrum Team understand the importance of clear

and brief Product Backlog items. The presence of a Scrum Master is vital when it comes to creating empirical product planning for complicated situations, as well as encouraging collaboration with stakeholders when necessary or as requested. The Scrum Master assists an organisation in many aspects, including leading, training, and coaching the organisation in its Scrum adoption, planning and advising Scrum implementations within the organisation, helping employees and stakeholders comprehend and execute an empirical approach for complex work, and removing obstacles between stakeholders and Scrum Teams (Schwaber et al., 2020). In essence, the Scrum Master acts more as a team coach than a team leader.

The Scaled Agile Framework guideline dictates that the Scrum Master/Team Coach (SM/TC) helps the team achieve its delivery goals. They coach the team on self-organisation and self-management and support them in coordinating and participating in Agile Release Trains (ARTs) events, thereby enhancing the effectiveness of SAFe across the organisation. SM/TCs are vital members of Agile teams and share the responsibility for their overall performance with the team. The SM/TC possesses the specialised expertise necessary for implementing SAFe Scrum methodologies. Their responsibilities include identifying and addressing any potential gaps in the process, as well as ensuring that the team is equipped with the knowledge and skills required for planning, executing, reviewing and retrospection. The responsibilities in the Scaled Agile Framework are facilitating PI planning and working closely with other SM/TCs and the Release Train Engineer (RTE) during PI planning. They support Agile Teams during the iteration, increasing the chance of attaining the iteration goals and PI objectives. They can significantly enhance the team's workflow, eliminating bottlenecks, delays, and waste. SM/TCs are responsible for building high-performing teams that create high-value increments of working solutions. They help Agile Teams improve the overall ART performance.

2.1.2.2 Product Owner

The product owner plays an essential role in Scrum (Kadenic et al., 2023). They act as a link between the stakeholders and the team. Their primary responsibility is prioritising the product backlog according to the stakeholders' needs. This role is crucial for the success of Scrum. Learning to effectively serve as a product owner can prove to be a difficult undertaking, mainly due to factors such as organizational culture, structure, management style, and team dynamics. As a product owner, one is responsible for overseeing both present and future tasks to ensure that team members are involved in the appropriate activities, resulting in a well-rounded, fulfilling, and varied work experience. The literature specifies that product ownership is crucial for the success of an organisation (Kadenic et al., 2023).

Based on a systematic literature review, the following research analyses the role of a Product Owner, focusing on the responsibilities of the Product Owner (Kadenic et al., 2023; Schwaber et al., 2020). Additionally, the identified challenges related to the Product Owner role are presented.

According to the Scrum Guide (Schwaber et al., 2020), it is the responsibility of the Product Owner to ensure that the value of the product is maximised through the work of the Scrum Team. The methods to achieve this goal may vary depending on the organisation, Scrum Teams, and individuals involved. The individual responsible for the product is also liable for successfully managing the product backlog. This includes the development and communication of the product goal, the creation and communication of product backlog items, the prioritisation of product backlog items, and ensuring that the product backlog is transparent, visible, and easy to comprehend. The Product Owner may delegate these responsibilities to others, but they remain accountable. One individual serves as the Product Owner rather than a group, and their responsibility is to represent the requirements of several stakeholders within the Product Backlog.

according to (Kadenic et al., 2023; Remta et al., 2021; Uludag et al., 2017; Sachdeva, 2016), the responsibility of guaranteeing the project delivers maximum value lies with the Product Owner. This involves providing direction, managing the product lifecycle, and bringing new products to life. When determining the features and sequence for developing the product, the Product Owner must consider the requirements and priorities of the organisation, customers, and end-users. By balancing these factors, the Product Owner can ensure that the product delivers the desired outcomes and meets the expectations of all stakeholders. The development, maintenance, gathering, and prioritisation of features, requirements, or user stories in the product backlog are the responsibilities of the Product Owner. Acting as the liaison between the team and external stakeholders, the Product Owner is responsible for all communication. The Product Owner represents stakeholders by clarifying needs and communicating them to the development team. The Product Owner collaborates closely with stakeholders to define product backlog items. To ensure that technical requirements and customer needs are met, the Product Owner must communicate effectively in technical terms to represent the customers' needs in the self-organised development process. As a result, the Product Owner acts as a single point of contact for the project, guiding the development team on the functionality that must be delivered to meet the needs of all stakeholders. The Product Owner must also make themselves available to the team, protect them from external pressures, and resolve internal conflicts. He also has to ensure that the development team's work is productive. He decides when software features meet the definition of 'done' and are approved for customer release. The technical involvement of a Product Owner encompasses many aspects, such as designing, implementing, and sharing a reference architecture for big projects. In addition, they join in testing activities, ensure that the needs are met, and manage technical risks while working on a project. On the business side, the obligations may shift

towards delivering user support, while at the team level, the focus may move beyond coordinating the team to leading the team.

Product Owner Role Challenges (Kadenic et al., 2023):

The Product Owner may become too focused on business and lack architectural and technological knowledge and competence. The Product Owner might have difficulty communicating and providing timely feedback due to being busy and unavailable. The Product Owner must manage opposing forces and might find themselves in a difficult position. Additionally, the activities exceed the capabilities of a single individual. Product owners who are stressed and overloaded can severely impact the overall performance of the organisation.

The Scaled Agile Framework Guide states that each Product Owner (PO) represents the interests of customers and the business within a specific Solution domain alongside a Product Manager. The two work together to ensure product strategy and execution remain aligned throughout the value stream. Being the 'voice of the customer' for the team involves a wide span of responsibilities, such as building and managing key relationships, synthesising information from multiple sources, maintaining business alignment in the Team Backlog, and communicating effectively with various audiences. The PO is responsible for connecting with customers, contributing to the vision and roadmap, managing and prioritising the team backlog with input from Product Management, System Architecture, and other stakeholders, supporting the team in delivering value, and getting and applying feedback.

2.1.2.3 Product Manager/Chief Product Owner

On the program level, the Product Manager (PM) works with Product Owners (PO) to enhance feature delivery and direct their work (Uludag et al., 2017). According to (Maglyas et al., 2013; Tkalich et al., 2022), the PM is responsible for strategy and vision definition, roadmap planning, release planning, pricing, product lifecycle management, managing and prioritising the ART backlog, product requirements engineering, and communicating with POs and customers. Apart from the main responsibilities, the product manager may also have additional tasks that can be assigned to other departments. These include portfolio management, product analysis, product launches, product support, and software development for the product.

According to the Scaled Agile Framework Guide, product management is the function responsible for defining desirable, viable, feasible, and sustainable solutions that meet customer requirements. It supports development across the product life cycle. It includes exploring markets and users, connecting with customers throughout the product life cycle, defining product strategy, vision, and roadmap (portfolio management, lean budgeting), managing and prioritising the ART backlog, and delivering value.

The Product Manager interacts with customers, alongside other SAFe roles, to maintain positive customer relations, and develops product features based on the client's needs. The role of a Product Manager is to focus on the requirements and desires of the customer. In the SAFe framework, the Product Manager is the leader driving the product forward and is considered the valid owner (Remta et al., 2021). Product managers are crucial in researching the market and creating product requirements. They are often referred to as product champions, responsible for executing business plans that deliver maximum value to customers (Maglyas et al., 2013).

According to the literature, a product manager is portrayed as an expert, strategist, leader, or problem solver who makes all the decisions (Maglyas et al., 2013). However, this study reveals that a product manager's role varies and can differ depending on the company's size, business, and domain. Therefore, a product manager may be required to wear many hats. As a product manager, it is important to identify the features that provide the most value for customers. This involves communicating and establishing customer requirements, market trends, competitors, and potential markets for selling. To achieve this, the product manager collaborates closely with various teams, including product development, marketing, project management, finance, engineering, and sales. The product manager can successfully produce high-quality products by utilising these departments as resources. The responsibilities of a product manager can differ significantly depending on the company. When there are many activities, it is unrealistic for one person to handle them alone. This means that responsibilities are shared among different people. As a result, it can be challenging to keep track of the role of a specific product manager and understand the overall product management structure in the organisation. Identifying the roles of a product manager can assist software product managers in determining the path for their career growth and skill development aligned with the company's strategy. Defining the role of a product manager in an organisation can be challenging as the job title does not offer a clear understanding of the manager's responsibilities. Although the concept of product management has been around for quite some time, the specific duties of a product manager within an organisation remain unclear.

2.1.2.4 Release Train Engineer

According to the Scaled Agile Framework Guide, the Release Train Engineer (RTE) is an Agile coach who helps teams deliver value. They facilitate ART events and processes, communicate with stakeholders, manage risks, escalate obstructions and drive continuous improvement. Although Agile Release Trains (ARTs) consist of self-organising teams, RTEs play a crucial role in steering and guiding them. They act as servant leaders and have a solid understanding of scaling Lean and Agile practices. The RTEs are responsible for facilitating PI planning, coaching the ART, supporting PI execution, optimising flow, and improving relentlessly. The goal is to maintain a continuous flow and enable quick movement of new features from concept to cash.

A group of agile teams that frequently delivers incremental releases of value is called an Agile Release Train (ART), and all the teams under SAFe belong to one ART. It is the duty of each agile team to define, construct, and test the stories from their team backlog over a series of iterations. They must follow a common iteration cadence and synchronise their activities with other teams to ensure that the entire system is iterating in unison. The responsibility of understanding how to scale agile practices and acknowledging the chances and challenges of aligning and facilitating an ART lies with the RTE (Uludag et al., 2017; A.B. Consortium).

According to (Gustavsson, 2018), SAFe suggests that each team have a single Product Owner (PO), and to manage these POs, an additional role called Release Train Engineer (RTE) is recommended. The Release Train Engineer (RTE) is accountable for managing an upcoming release and collaborating with Product Owners (POs) and Scrum Masters (SMs). Essentially, the RTE acts as a "Chief PO" or "Chief SM", overseeing both "Monitoring and Updating" and "Boundary Spanning" practices. The RTE and POs use portfolio and program backlogs to plan and coordinate team efforts, as well as address any dependency issues that may arise.

2.1.2.5 Line Manager

According to (Ljung et al., 2019), managers in traditional management organizations used to have the most advanced skills and held executive authority. Their duties involved closely supervising, exercising tight control over change and uncertainty, and delegating work. Historically, line managers were responsible for managing and assigning work, and they needed technical abilities. However, in organisations that adopt agile development methods, the teams are self-organising and work autonomously; thus, different management methods are needed compared to the traditional. Agile management is all about embracing complexity and nonlinear thinking. Management in an agile setting should coordinate and facilitate teams, remove hurdles that may hinder team performance, and trust their teams to deliver the best solutions. In an agile organisation, a line manager becomes more involved in HR, interpersonal tasks, and transformation work. They are responsible for individual development paths, feedback, and possible role changes. Their command-and-control work disappears in scaled agile and gets a more supporting role towards the teams. Employees' health, hiring, feedback and assessment, competence development, salaries, and work environment are the responsibility of line managers. They also perform meetings with the product owners, scrum master, upper management, and developers.

According to (Op de Beeck et al., 2015), the overall idea is that line managers are responsible for putting HR practices into action, which will impact the attitudes and actions of employees. This will ultimately lead to positive outcomes for both the individuals and the organisation. In other words, line managers play a crucial role in implementing HR policies in the workplace. They are responsible for translating these policies into action through their HR role. Line managers require adequate assistance

and guidance from HR professionals to acquire the necessary HR skills and motivation to perform their HR role effectively. As line managers are not experts in HR, they depend on HR professionals' support, encouragement, and advice to fulfil their HR responsibilities efficiently. Line managers have certain expectations from HR, which include providing suitable personnel with the correct skills at the appropriate time. Additionally, they look towards HR to provide guidance on complex matters and problematic cases. HR is also expected to support the long-term development of staff, by fostering skills within their current roles and preparing them for future career growth.

Human resource management practices have the power to affect an individual's ability to perform well in a job (through the use of appropriate selection, hiring, and training processes), their motivation to work hard (by offering performance-related pay), and their opportunities to contribute to the success of a company (by implementing team-based or suggestion systems). This can ultimately lead to improved organisational performance (Bos-Nehles et al., 2013).

2.1.2.6 Team members/Agile team

According to (Hoegl et al., 2001), team members' motivation and ability to engage in future teamwork should be enhanced by the way teams work. The importance of teamwork in software development is evident from the fact that the success of team members increases their motivation to work on future projects. Therefore, it can be concluded that teamwork is a crucial aspect of software development. If a team is utilised effectively and given adequate training, it has the potential to result in higher levels of output, boosted spirits, enhanced creativity, and increased innovation (Dione et al., 2004).

According to the Scrum Guide by (Schwaber et al., 2020), the Scrum Team has Developers who are responsible for building any part of a usable product within each Sprint. The skills required by Developers vary depending on the project's domain. However, they are always held accountable for creating a plan for the Sprint, known as the Sprint Backlog. Developers are responsible for ensuring quality by adhering to a Definition of Done. They must adapt their plan daily based on the Sprint Goal and hold each other accountable as professionals.

An Agile Team, as defined by the Scaled Agile Framework Guide, is typically composed of no more than ten individuals who have all the necessary skills to define, build, test, and deliver value to their customers. Teams may belong to one of two categories - technical teams that concentrate on constructing digital solutions or business teams that execute business functions. In some cases, they may even be a combination of both. Hence, Agile teams have the responsibility to deliver results that satisfy the requirements and desires of their customers and stakeholders by means of self-organization and self-direction. By delivering work in small increments, Agile Teams aim to learn quickly, receive feedback from customers, assess the results, and adjust accordingly. Their primary responsibility is to understand customer needs and define the functionality required to meet them. Agile teams have the

ability to plan their own work, which enables them to remain aligned with the rest of the train and improve their work within a short timeframe. Planning involves the participation of all team members and relies heavily on collaboration and transparency.
Value delivery is the key task of an Agile Team. To achieve this, the team must be capable of defining, building, and testing its stories. To move forward effectively, both customer and technology feedback is necessary. Agile teams always seek ways to improve their processes and the outcomes they are responsible for.

According to (Tripp et al., 2016), self-organizing groups, known as agile development teams (ADT), work together to create and modify software systems. These teams are typically composed of individuals with varying skill sets, including analysis, programming, design, database architecture and administration, systems engineering, and project management. It is common for ADT team members to have varied responsibilities and titles depending on the organisation they work for. In summary, an ADT is a team of professionals from different disciplines who collaborate to develop and maintain software. ADT primarily follows agile practices such as iterative delivery or pair programming. The team members' primary responsibility is to deliver software rather than managing external business or team management. The responsibilities towards the project management approach are performing daily stand-up meetings so each member of the team can provide updates on the work they completed the previous day, their plans for the day, and any issues they are facing that may hinder their progress. receiving immediate feedback from the environment after each iteration, enabling them to generate code more effectively. During the retrospective meetings, the ADT members reflect on their work and suggest or adopt modifications for the next cycle.

Agile development teams have been found to facilitate collaboration, coordination, and communication, as per various studies (Lindsjorn et al., 2016). In agile development, some studies have analysed teamwork using team performance models, such as the one found in Hoegl and Gemuenden (2001). The Hoegl and Gemeunden teamwork model focuses only on interactions.

According to (Hoegl et al., 2001), the degree to which a team can achieve predetermined quality, cost, and time goals can be referred to as team performance. This research outlines team performance in two subcategories efficiency and effectiveness. The team's effectiveness is determined by the extent to which they fulfil the expectations related to the quality of the product. Factors such as functionality, robustness, reliability, and performance are considered by customers while evaluating the quality of a software product. The team's efficiency, on the other hand, is determined by the extent to which they fulfil the expectations related to the quality of the project.

2.2 A Brief History of Work Design and the Connection to Agile Roles

The following section of the literature review establishes a relationship between the roles in the Scaled Agile Framework and the Job Design Theory of Human Resource Management (HRM). This connection is crucial as it helps us understand the agile roles better from a job design standpoint.

Effective organisations recognise that HRM practices are a critical factor directly impacting employee performance (Hassan, 2016; Maaitah et al., 2018). The organisation's performance is closely tied to the performance of its employees. Organisations must recruit skilled and capable employees to succeed in today's global environment. HRM practices involve recruiting, motivating, and retaining employees to ensure the organisation's survival. Effective HRM practices are crucial for organisations to achieve their goals by utilising the potential of their employees. By appropriately implementing HRM practices, employers and employees can benefit from increased commitment, engagement, and high performance. Human resource management practices, such as compensation, career planning, training and development, employee involvement, and performance appraisals, motivate employees to work harder to improve organisational performance.

The focus of HRM is macro, and it blends intellectual motivations with strategy, economics, and finance (Answer et al., 2021; Becker et al., 2010). The framework of Human Resource Management (HRM) clearly defines a job as a tool to accomplish an organisation's strategic goals. Job design is an individual level of HRM practice and mainly deals with the nature and structure of the work itself. It is a micro-level approach. Since work plays a significant role in our lives, the literature on job design tends to concentrate on the social and psychological factors that influence individuals in those jobs.

Job design is a fundamental research focus in Human Resource Management (HRM) (Foss et al., 2009). This refers to the process of deciding the specific job structure. This involves identifying the necessary tasks and activities and distributing them among employees to allow the company to benefit from specialisation and combine job tasks to consider potential synergies between them. Job design involves defining the tasks and obligations assigned to employees. The goal of the Human Resources (HR) manager is to create job duties that are tailored to each individual’s strengths, enabling them to perform at their best while remaining engaged and motivated. The importance of job design lies in its ability to impact the motivation of employees. Therefore, the design of a job plays a critical role in motivating employees. It has been established since the studies conducted by Hackman and Oldham in 1975 and 1976 that management can shape job roles to affect factors such as autonomy, task identity, and feedback levels that employees receive. These job characteristics directly impact the employee's motivation levels.

Organisations use job design to create new jobs or redesign existing ones (Hackman et al., 1975). The goal of job design is to make tasks or jobs more engaging and interesting for employees. It is essential for boosting an employee's motivation, positively affecting their personal and work performance. One of the most effective ways to optimize employee performance has been through job design (Zareen et al., 2013). It can be explained as changing the content and processes of a job to increase an employee's satisfaction, motivation, and productivity (Hackman et al., 1975; Morgeson et al., 2008; Zareen et al., 2013). The design of jobs and employee reactions to those jobs have been the target of considerable research in recent years. Some studies emphasize the importance of expanding and enhancing the job to increase its motivational capacity. They consider the worker to be creative, self-driven, and responsive to an encouraging environment (Campion et al.,1983). Studies have shown that workplace design is essential for individual, group, and organisational outcomes (Morgeson et al., 2006). Due to the increasing importance of job design, different researchers have studied and developed many theories concentrating on the key characteristics of jobs or work.

This paper will discuss job design theories starting with the oldest to the most recent model. Herzberg's motivation-hygiene theory, developed in 1959, will be the first model to be discussed. The dominant job characteristics theory of Hackman and Oldham, 1974, 1975, and 1978, will also be covered. Campion and Thayer suggested four different interdisciplinary approaches to job design in 1985 and 1988. Lastly, the most recent job design model, developed upon the job characteristics theory by Morgeson and Humphrey in 2006, 2007, and 2008, will be presented.

2.2.1 Herzberg's Motivation-Hygiene Theory (1959)

The concept of the motivation-hygiene theory, two-factor theory, or dual-factor theory of Herzberg is that there is a difference between motivation and hygiene factors affecting job satisfaction. The hygiene factors are viewed as less important to job satisfaction and relate to avoiding unpleasantness. The hygiene factors included company policies and administration, supervisor relationships, interpersonal relations, working conditions, and salary. At the same time, the motivation factors lead to job satisfaction because of the need for individual self-growth and self-discovery. The motivation factors included achievement, recognition, the work itself, responsibility, advancement, and the possibility of growth. Herzberg reported motivation factors as intrinsic to the job and hygiene factors as extrinsic (Herzberg et al., 1959; Herzberg 1966, 2003; Alshmemri et al., 2017).

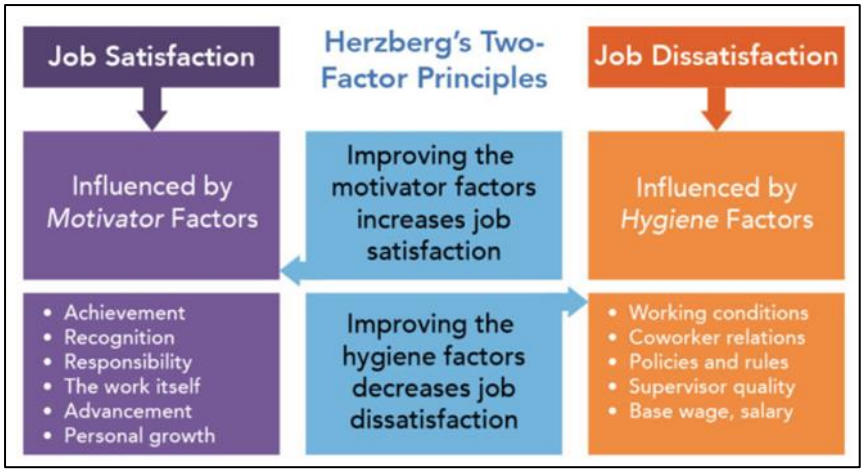


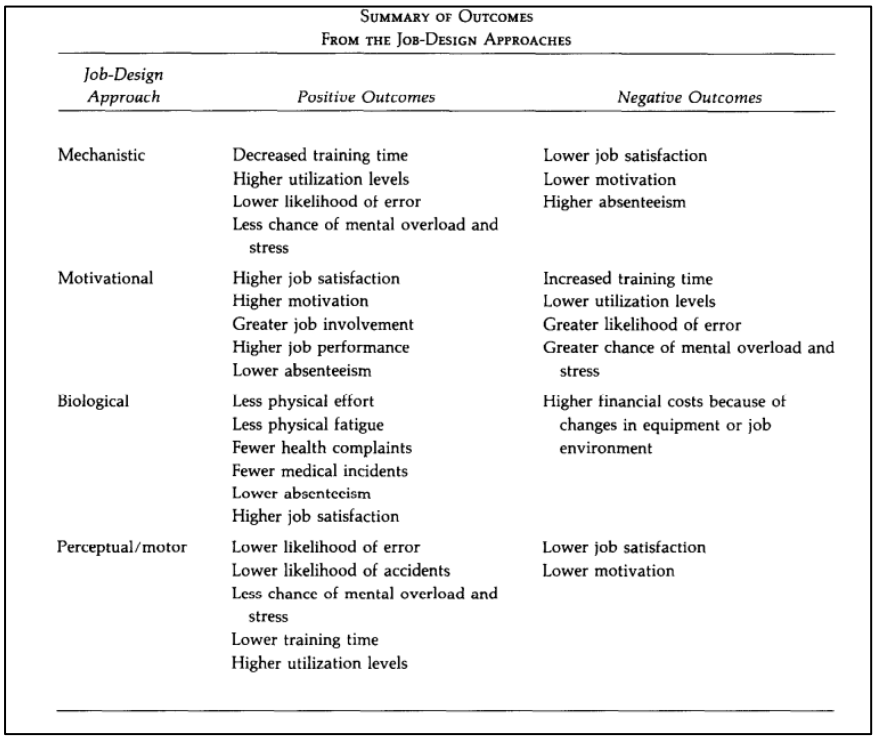
Figure 5 Motivation-Hygiene Theory Framework

2.2.2 Campion's Interdisciplinary Approaches to Job Design

Campion and Thayer, 1985, suggest four different interdisciplinary approaches to job design, each with different outcomes. Each approach has benefits and costs, and no single approach is best. The motivational approach has its roots in the studies conducted on job enrichment, job enlargement, and the features that make a job motivating. This approach is associated with employees who are more satisfied, motivated, and involved in their jobs, thus connected with satisfactory outcomes. There is low absenteeism and high performance whose job is characterised by high motivation. On the downside, jobs with high motivational approaches require extended training and experience, are difficult to hire because of great mental demand, employees are more inclined to suffer stress and mental overload, and mistakes are more likely to occur. From the mechanistic approach, most low-level factory jobs are designed. This concept is the specialisation and simplification of tasks and skills needs. Mental demands, stress, and overload are unlikely, and training times are very short. Mistakes are unusual because they are less likely to occur. The disadvantages of this approach are that employees are less satisfied, less motivated, and higher absenteeism. There might also be health complaints and injuries caused by carelessness, which results from repetitive and machine-paced work. This approach relates to efficiency outcomes. The biological approach appeared from biomechanics, work physiology, anthropometry, and the ergonomics literature. The goal is to ensure that people's physical capabilities and limitations are not exceeded by their jobs' design (a frequently ignored consideration). Jobs high on the biological approach require less physical effort, resulting in fewer health complaints and injuries than other jobs, thus connected with comfort outcomes. The perceptual/motor approach, derived primarily from experimental psychology, emerged from research on human factors engineering, skilled performance, and human information processing. This approach ensures that people are not pushed beyond their mental capabilities and restrictions. The goal of designing jobs around perceptual/motor limitations is to decrease the likelihood of errors, accidents, and the general mental demands of a job, connecting it with reliability outcomes. This method helps

to avoid mental exhaustion and anxiety, shortens training periods, and enhances utilization levels (i.e., the proportion of employees who can execute the tasks with minimal or no instruction). This method, however, may have the downside of decreasing job satisfaction and motivation due to the lack of mental stimulation that comes with the job.

Although research in the field of work design has been ongoing for many years, there has been little new theoretical work in this area over the past two decades. Moreover, despite the existence of various perspectives on work design, there has been little integration among these different perspectives. Their theoretical models tend to be relatively limited. Their conceptualisation missed such key work characteristics as autonomy (Morgeson et al., 2006). The Multimethod Job Design Questionnaire (MJDQ) designed to measure this model suffers problems and gaps in construct measurement.



SUMMARY OF OUTCOMES FROM THE JOB-DESIGN APPROACHES

Job-Design Approach	*Positive Outcomes*	*Negative Outcomes*
Mechanistic	Decreased training time Higher utilization levels Lower likelihood of error Less chance of mental overload and stress	Lower job satisfaction Lower motivation Higher absenteeism
Motivational	Higher job satisfaction Higher motivation Greater job involvement Higher job performance Lower absenteeism	Increased training time Lower utilization levels Greater likelihood of error Greater chance of mental overload and stress
Biological	Less physical effort Less physical fatigue Fewer health complaints Fewer medical incidents Lower absenteeism Higher job satisfaction	Higher financial costs because of changes in equipment or job environment
Perceptual/motor	Lower likelihood of error Lower likelihood of accidents Less chance of mental overload and stress Lower training time Higher utilization levels	Lower job satisfaction Lower motivation

Figure 6 Campion's Job Design Framework

2.2.3 Job Characteristics Theory

The next major influence in work design research is Hackman and Oldham's (1974, 1975, 1978) Job Characteristics Theory (Morgeson et al., 2006). This model is a theory based on implementing principles for enriching jobs; making a task or job more interesting is critical to an employee's motivation (Hackman & Oldham, 1974, 1975, 1978; Ali et al., 2013). The theory suggests that the five main dimensions of a job, skill variety (SV), Task identity (TI), Task significance (TS), autonomy, and feedback, produce three critical psychological states, which lead to five favourable

personal and work outcomes (Hackman & Oldham, 1974, 1975, 1978; Ali et al., 2013; Piccolo et al., 2010).

According to Hackman and Oldham, 1974, 1975, and 1978, Skill variety, task identity, and task significance produce or are related to the psychological state of experienced meaningfulness of work. This state is defined as the degree to which an employee experiences the job or work as important and valuable and can present one's value to other people or the external environment. Autonomy is related to the psychological state of experienced responsibility for work outcomes. This state is defined as the degree to which employees feel accountable and responsible for the results of the tasks they perform. Feedback from the job is related to the psychological state of knowledge of the actual results of the work activities. This state is defined as the degree to which an employee knows and understands how effectively one performs the job. When these three psychological states were present, they would lead to personal and work outcomes such as internal work motivation, task performance, low absenteeism, and turnover, including job satisfaction, which is also referred to by (Ali et al., 2013; Piccolo et al., 2010). Job satisfaction can be used as a technique to motivate employees to work harder (Ali et al., 2013). According to research conducted by Hackman et al. in 1974, 1975, and 1978, the five job dimensions have a positive correlation with work satisfaction and motivation. The satisfaction level of employees has been found to be a predictor of both turnover and absenteeism, indicating that lower satisfaction often leads to higher turnover and absenteeism rates. On the other hand, internal work motivation has been found to have a direct effect on the quality of work performance.

Additionally, the model proposes three moderators: growth need strength (GNS), knowledge and skill, and context satisfaction, which moderate the relationship between the job characteristics and the psychological states and the psychological states and outcomes (Hackman & Oldham, 1974, 1975, 1978; Ali et al., 2013; Piccolo et al., 2010; Fried et al., 1987; Cruz, 1986). The GNS is the strength an employee needs for achievements, learning, and growth. This moderator must be high in employees for them to have internal motivation to be able to accept higher levels of challenges and complex jobs. For the second moderator, employees must have adequate or high levels of knowledge and skill to meet challenges and complex jobs and succeed. Lastly, employees satisfied with contexts such as pay, colleagues, managers, and job stability respond more positively to highly motivating jobs; therefore, this moderator needs to exist and influence positively if there is potential for success.

Finally, the model proposes a "motivational potential score" (MPS), which combines the five core job characteristics into a single index or summary score that indicates the overall potential of a job to influence the individual's feelings and behaviours (Hackman & Oldham, 1974, 1975, 1978; Fried et al., 1987) or as stated by Cruz, 1986, how well the employees perceive the job characteristics to consider acceptable work conditions. The MPS is formulated as follows:

$$\text{MPS} = \frac{Skill\ Variety + Task\ Indentity + Task\ Significance}{3} \times Autonomy \times Job\ Feedback$$

To assess the theory of the job characteristics model of Hackman & Oldham, 1975, two instruments were created: the Job Diagnostic Survey (JDS) and the Job Rating Form (JRF). The job diagnostic survey (JDS) is a widely used and accepted instrument to measure the five core dimensions of a job, the critical psychological states, and work outcome, and two of the suggested moderators, growth need strength and context satisfaction (Hackman & Oldham, 1974, 1975, 1978; Fried et al., 1987; Cruz, 1986). The JDS is intended to find out if existing jobs might be redesigned to improve motivation and productivity and evaluate the effects of job changes on employees.
The Job Rating Form (JRF) is usually executed in conjunction with the JDS and was developed simultaneously with the JDS (Hackman & Oldham, 1974; Cruz, 1986).

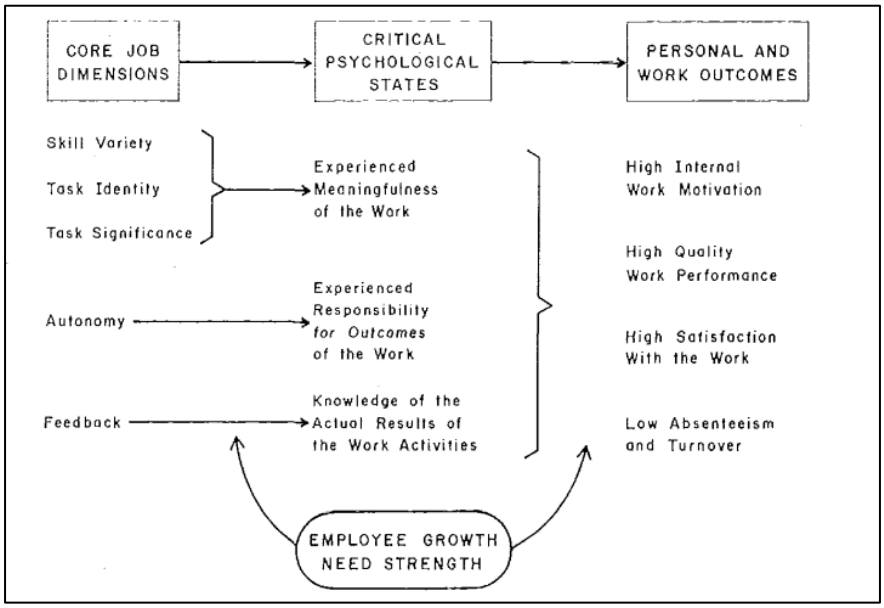


Figure 7 Job Characteristics Theory Framework

2.2.4 Morgeson's Expanded Work Design Model

Morgeson and Humphrey, 2008 expanded their view on job design from a small set of motivational work characteristics to one that includes many social and contextual features with expanded outcomes. According to them, there are three reasons why work design is important. First, work design is a disciplined method to know what people like and do not like about their work and how to improve it. Second, the business environment is changing in the service industry, where providing superior service and creating innovative products using self-managing teams is vital to success. In such an environment, collaboration, flexibility, and problem-solving become important. In response to these changes, work structures have evolved with the introduction of team-based work. Work design is there to understand how these changes affect work-related outcomes. Third, work design is essential to managers, workers, and organisations. The managers are in charge of designing and re-designing the work of their subordinates to the skills of the individual worker. The workers also craft their work to suit their capabilities, interests, or situations. Finally, productivity, cost control, innovation, learning, and worker morale are some of the varied outcomes that organisations seek to attain. By researching work design, one can gain an understanding of how to structure work in order to achieve these diverse outcomes.

Their goal is to expand the outcomes resulting from the job design features, even though there might not have been research investigating some of them. They aim to link this range of outcomes with the various work design features. The outcomes can be grouped into attitudinal, behavioural, cognitive, well-being, and organisational categories. Attitudinal outcomes reflect feelings about job, team, and organisation. This includes job satisfaction, team viability (the extent to which team members wish to stay together as a team), organisational commitment, job involvement, internal work motivation, and goal striving (Morgeson et al., 2006, 2008; Humphrey et al., 2007).

Behavioural outcomes show specific actions of workers or teams. The concentration is on quantity and quality of performance (efficiency, innovation, accuracy, customer service). Other key behavioural outcomes include absenteeism and turnover withdrawal behaviours (Morgeson et al., 2006, 2008; Humphrey et al., 2007).

Cognitive outcomes reflect work's developmental outcomes, which include role perceptions such as role ambiguity (confusion on their role responsibilities) and role conflict (the intersection between multiple roles on specific tasks and social responsibilities) (Morgeson et al., 2006, 2008; Humphrey et al., 2007).

Well-being outcomes reflect the physical and mental reactions to a job, such as anxiety, stress, positive and negative emotions, burnout or exhaustion, work/family issues, occupational safety, and physical health (heart disease) (Morgeson et al., 2006, 2008; Humphrey et al., 2007).

To develop a model that merges work and team design, the theorists began recognizing sources of work and worker characteristics (Morgeson et al., 2006, 2008; Humphrey et al., 2007). Identifying the source of various work and worker characteristics was their area of interest. They identified sources such as task, social, and contextual, which can be used as a cohesive mechanism across teams and jobs (Morgeson et al., 2006, 2008; Humphrey et al., 2007).

Previous studies have limited task characteristics, whereas recent studies show other more essential task characteristics (Morgeson et al., 2006, 2008; Humphrey et al., 2007). Alongside the five motivational work traits recognised by Hackman and Oldham (1974, 1975, 1978) - autonomy, skill variety, task identity, task significance, and feedback from the job - the literature has also considered five knowledge work characteristics. These include task variety, information processing, job complexity, specialisation, and problem-solving (Morgeson et al., 2006, 2008; Humphrey et al., 2007).

Autonomy, which is the freedom an individual has to carry out work. Autonomy is related to performance ratings and absenteeism outcomes. It reduces the number of well-being outcomes such as stress, anxiety, and burnout and cognitive outcomes such as role ambiguity and conflict. Autonomy is also related to cognitive outcomes such as job satisfaction, organisational commitment, and internal work motivation. Interestingly, research has shown that the concept of autonomy is diverse and encompasses various aspects, such as work scheduling autonomy, work methods autonomy, and decision-making autonomy.

Skill variety reflects the extent to which various skills are needed for job performance, and using them in a task is difficult. Having skill variety in a task is seen as worker engagement. According to this study, skill variety is related to outcomes such as worker motivation, involvement, and satisfaction.

Task Identity is the extent to which an individual completes an entire work. The related outcomes to this feature are worker motivation, organisational commitment, job satisfaction, and subjective performance evaluation. In addition, it is related to lower absenteeism, role conflict, and burnout. *Task Significance* reflects the degree to which a task impacts the lives of others, both inside and outside the organisation. There is a growing importance of task significance currently because of employees' interest in influencing others' lives through their work. Task significance impacts various attitudinal outcomes such as job satisfaction, organisational commitment, work motivation, and performance ratings. In addition, task significance is related to burnout and overload, suggesting that the 'weight' of what workers do runs the risk of crushing them.

Feedback from the job is related to where the job grants information about individual performance. it is associated with workers receiving timely and accurate feedback directly from their jobs. This is necessary as workers need this information to improve their performance and modify their behaviour

as appropriate. This feature positively relates to attitudinal outcomes such as work motivation and job satisfaction. It also negatively relates to role ambiguity, role conflict, and anxiety.

These five job characteristics are explained as they are the only ones used in this study. The remaining characteristics and their outcomes will be discussed in Appendix A.

To assess their job design theory, Morgeson and Humphrey created the Work Design Questionnaire (WDQ). Research has shown that work design is essential for various individual, group, and organisational outcomes (Morgeson et al., 2006). Their focus is on work design, which encompasses the job and its relationship to the larger environment, instead of solely focusing on job design.

The WDQ makes at least seven unique contributions to work design research (Morgeson et al., 2006). First, The WDQ is currently the most broad measure of work design accessible, integrating over four decades of research into one concise measure. Second, The WDQ has corrected various issues found in previous measures. One such problem is the use of complicated response scales and negatively worded questions, which can cause psychometric issues when measuring work traits. The WDQ strives to minimise these problems. Third, the WDQ scales consistently show high internal consistency and reliability. Their reliability exceeds the frequently used work design measure, the JDS. Fourth, Research on work design has previously shown inconsistent results when exploring the dimensionality of work. However, using CFA techniques, the researchers discovered strong evidence for a 21-factor model. This supports their complex categorisation scheme and offers a helpful model for guiding future research and application. Fifth, evidence showed a meaningful relationship between the WDQ scales and independent job-based databases. Earlier research on work design has also found this, but the researchers used a more extensive and contemporary set of external measures called O*NET. This gives valuable proof for the construct validity of the WDQ, indicating its ability to evaluate objective job properties. Sixth, the WDQ was able to recognise differences in many jobs. This implies that the WDQ can be useful in differentiating between jobs when applied in organisational settings for job classification or compensation motives. Seventh, The Work Design Questionnaire (WDQ) and its underlying model provide new opportunities for work design theory. These findings indicate that emphasising specific work characteristics could prevent the common trade-offs observed in work design.

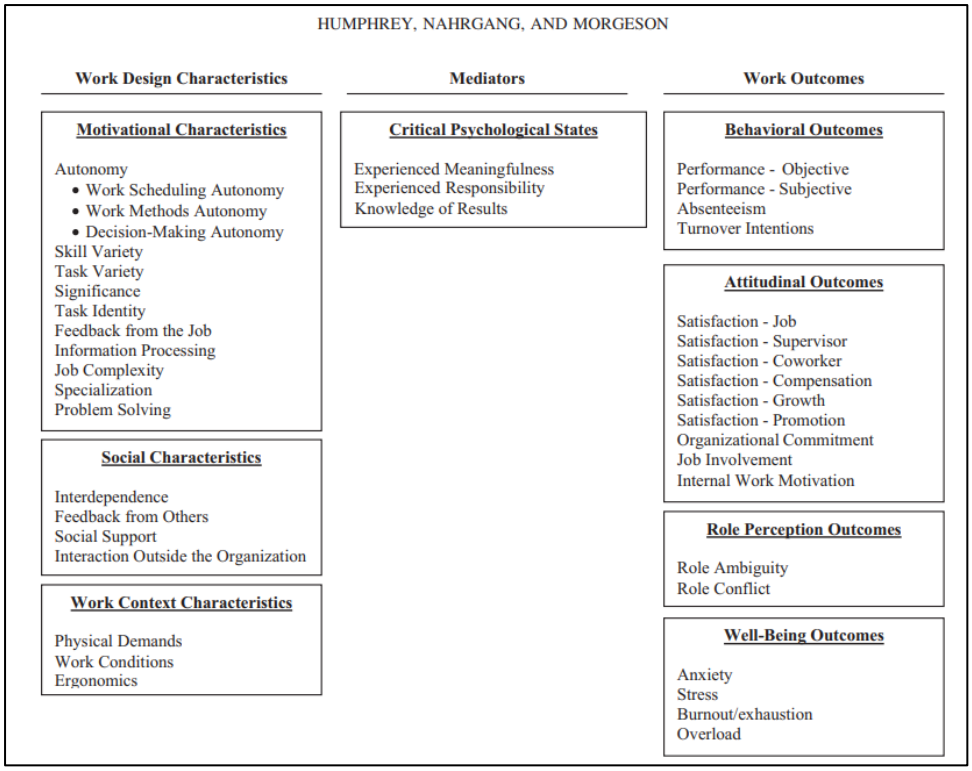


Figure 8 Morgeson Job Design Framework

3 Conceptual Model

To answer the research question, "How are the Scrum Master, Product Owner, Product Manager, Release Train Engineer, and Line Manager roles implemented in practice, and how does it impact their personal and work behaviour?"

The conceptual model in Figure 9 has been developed to hypothesise the connections between these concepts. This research will test this conceptual model.

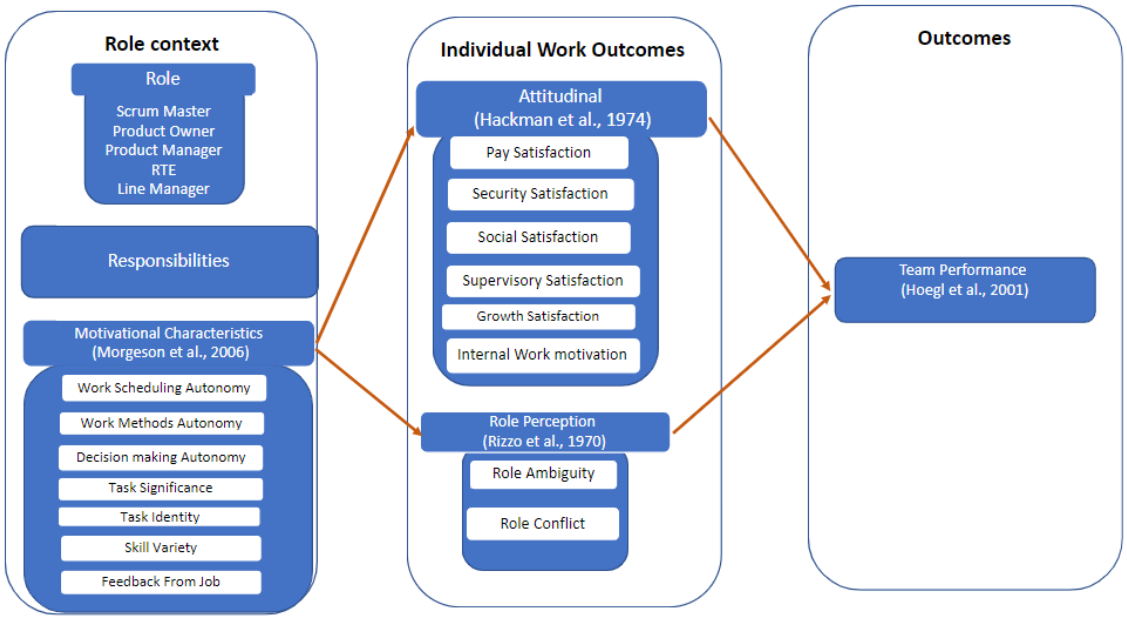


Figure 9 Conceptual Model of this study

The conceptual model is based on literature by Hackman et al. (1974, 1978) and Morgeson et al. (2007, 2008), as well as input from agile professionals. Hackman's job characteristics theory is chosen because it remains the dominant one, while the Morgeson job design theory is more recent and extensive. The model suggests that agile role responsibilities with motivational characteristics lead to individual attitudinal and role perception outcomes, eventually leading to team performance.

3.1 Explanation of the Model

Role Responsibilities: The Scrum Master, Product Owner, RTE, Product Manager, and Line manager roles and their related responsibilities adopted from the Frameworks and literature (Schwaber et al., 2020; Scaled Agile Framework Guide; Gustavsson, 2017, 2018; Uludag et al., 2017, 2019; Remta et al., 2021; Noll et al., 2017; Bass, 2014; Sachdeva, 2016; Kadenic et al., 2023; Maglyas et al., 2013; Tkalich et al., 2022; Ljung et al., 2019).

Motivational Characteristics: The job dimensions of the motivational characteristics are adopted from Morgeson and Humphrey's 2006 expanded job design theory.

Skill Variety: The extent to which different skills are needed for job performance and is related to outcomes such as worker motivation, involvement, and satisfaction.

Task Identity: The extent to which an individual completes an entire work. The related outcomes are worker motivation, organisational commitment, job satisfaction, subjective performance evaluation, lower absenteeism, role conflict, and burnout.

Task Significance: The degree to which a task impacts the lives of others, both inside and outside the organisation. The related outcomes are job satisfaction, organisational commitment, work motivation, performance ratings, burnout, and overload.

Autonomy: The freedom an individual has to carry out work. According to the researchers, the concept of autonomy is diverse and has various aspects, such as **work scheduling autonomy**, **work methods autonomy**, and **decision-making autonomy**. The related outcomes are job satisfaction, organisational commitment, internal work motivation, reduced stress, anxiety, burnout, role ambiguity, and conflict.

Attitudinal outcomes: This reflects feelings about the job, team, and organisation. This includes job satisfaction and motivation, which is based on (Hackman et al., 1974) theory.

Specific Satisfaction: This variable focuses on specific aspects of the employee's job satisfaction and measures the degree to which the employee is satisfied and happy with his or her work.

Pay Satisfaction: Related to fair compensation employees receive for their contribution to the organisation adopted from.

Security Satisfaction: Related to how stable things look for the employees in the future of the organisation adopted from.

Social Satisfaction: Related to how participants get to know, talk to, or help others while at work.

Supervisory Satisfaction: related to how much respect, fair treatment, support, and guidance employees receive from their supervisor in their work.

Growth Satisfaction: Related to personal growth and development opportunities and the employee's ability to exercise independent thoughts and actions in their jobs.

Internal Work Motivation: Related to the degree to which the employees are intrinsically motivated to perform successfully on the job.

Role perception outcomes: The dimensions of this outcome are role ambiguity and role conflict, which are based on (Rizzo et al., 1970) theory. To evaluate role ambiguity and conflict, a 30-item survey was created. However, some of the items were complex items with lower loadings, and only items loading greater than .30 were taken into consideration by this study.

Role Ambiguity: This variable is defined as the lack of clarity and certainty in role expectations and outcomes.

Role conflict: This variable is defined as the degree of mismatched expectations associated with a role.

Team Performance: Adapted from Hoegl and Gemuenden, who described team performance in terms of effectiveness and efficiency. Effectiveness refers to which the team meets the expectations regarding the quality of the outcome. On the other hand, the team's efficiency is evaluated regarding adherence to schedules and budgets.

3.2 Foundations of the Conceptual Model

The motivational characteristics, attitudinal outcomes, and role perception outcomes are all adapted from Morgeson and Hackman's assessment tools, JDS and WDQ. It would be beneficial to describe how the researchers created these assessment tools for the relevant variables.

3.2.1 Job Diagnostic Survey

The JDS underwent three major revisions during a two-year development period. Over 1,500 individuals have taken the test for more than 100 different jobs across various organisations (Hackman et al., 1974, 1975). The JDS is a comprehensive and reliable tool for assessing job satisfaction and performance. The instrument underwent revisions considering psychometric and substantive factors. Items were added, deleted, and modified to increase scale reliabilities and discrimination among scales based on empirical data. On the other hand, attempts were made to keep the content of items that measure a particular construct as diverse as possible to enrich the measures with substantive information. During the development of the JDS, various analyses were carried out to evaluate the validity of the theory on which the instrument is based. The results obtained from these analyses were then used to make changes and improve the theory and the instrument simultaneously. The JDS measured each class of variables, except for the "specific satisfactions," in two different survey sections. The questions were written in two formats to ensure the substantive content and measurement technique were not mixed up. The survey used a seven-point response scale, where 1 represents low, and 7 represents high.

The Job Diagnostic Survey (JDS) measures five main job dimensions: autonomy, skill variety, task identity, task significance, and feedback, as well as three psychological states and the growth need strength moderator (Hackman et al., 1974, 1975). The Job Descriptive Scale (JDS) is a tool that measures various personal and affective reactions or feelings that an individual feels while performing their job. However, it does not assess the actual work outcomes such as productivity, turnover, absenteeism, or employee perceptions of their productivity. The personal outcomes that JDS measures include general satisfaction, specific satisfaction related to pay, security, social aspects, supervisory and growth, and internal work motivation.

3.2.2 Work Design Questionnaire: A Measure for Assessing Work Design

To create the WDQ, the researchers conducted a thorough review of the existing work design studies, identifying important work characteristics and measures used in the past (Morgeson et al., 2006). The review was used to create items to examine the identified characteristics. These items were developed to overcome any shortcomings in current measurements and provide a concise set of scales. The work characteristics were categorised into three major categories: motivational, social, and contextual, which were taken from the framework developed by Morgeson and Campion (2003). The WDQ provides a broad set of work characteristics (compared with Morgeson & Campion, 2002) to view when revising jobs (Morgeson et al., 2006).

To create the WDQ, the developers conducted a literature search to identify relevant items for each construct (Morgeson et al., 2006). While their objective was to utilise existing items whenever possible without making any changes, sometimes this proved unfeasible. When they could not use existing items, they adapted and developed new ones. They followed several guiding principles while selecting, revising, or creating new items. The WDQ is thus a combination of existing items (17%), adapted (modified) items (33%), and new items (50%). They chose to use a relatively simple response scale. The reason for this was that incorporating a complex response scale in job design can result in a significant increase in irrelevant variables. As such, all items used a simple 5-point strongly disagree to strongly agree scale. They used a minimum of four items to assess each construct to maintain a reasonable survey length while achieving adequate internal consistency and reliability. The only exception to this rule was when it was believed that multiple dimensions of a construct existed, like in the case of the three aspects of autonomy. Each subdimension was measured using three items. For example, the autonomy scale consisted of nine items. The focus of the items was on the job itself rather than an individual's response to it. This approach was taken because it is the job's properties themselves and not personal reactions that matter when measuring work design. Instead of random distribution, the items were grouped based on work characteristic construct. Research has shown that this approach provides distinct psychometric advantages, especially with work characteristics.

To explore the structure of the WDQ, the researchers analysed five models (4, 18, 19, 20, and 21-factor model) using confirmatory factor analytic (CFA) techniques (Morgeson et al., 2006). This allowed them to make conclusions based on the absolute fit of one model and the relative fit of the alternative model. Based on their research, they found that the 21-factor model, which divided interdependence into two factors and autonomy into three factors, was the most suitable for their data. They then created scales by averaging the items for all further analyses. Overall, The WDQ scales show great variation and do not appear to have any issues with minimum or maximum limits. Additionally, the WDQ scales demonstrate outstanding reliability in terms of internal consistency.

4 Methodology

To address the research question, evaluate the conceptual model, and achieve a satisfactory level of external validity, data was gathered from a diverse group of agile practitioners. For this purpose, a survey was created to acquire an appropriate sample size. Distributing a survey is a simple task that allows for easy access to a larger sample size. Self-administration of surveys also helps to minimise the impact of desirability biases due to anonymity. Additionally, surveys are a reliable method for gathering real-world information and are straightforward to implement. No limitation is set regarding years of experience for roles and frameworks, entry-level or company. The online tool Qualtrics was used to write and share the survey anonymously. Multiple survey versions were tested and submitted to expert input to improve survey quality. This resulted in adjusted questions enabling all participants to provide answers.

4.1 Survey Design and Data Collection Analysis

4.1.1 Survey Design

All respondents received a twenty-page online survey with an anonymous link distributed through social media posts, emails, and personal networks. The average time to complete the survey was about 15-20 minutes. The survey's introductory page provided information regarding the research's objective, intended audience, duration, confidentiality, and contact details.

Descriptive Measures: The first section of the survey collected participants' current roles, total work experience and experience with agile practices in years, level of allocation of the roles, organisation size, task interdependency and goal conflict levels, the respective responsibilities of the roles, and entry-level jobs.

*Role Responsibilities***:** The responsibilities of the agile roles are adopted from the Scrum Guide, Scaled Agile Framework Guide, literature and professional feedback and review. Below is an example of the Scrum Master skills with references. For an elaborate view of all the roles, please see the appendix.

SCRUM MASTER							
SKILLS / REFERENCES	Scrum Guide	Scaled Agile Framework Guide	Noll, J., Razzak, M. A., Bass, J. M., & Beecham, S. (2017). A study of the Scrum Masters role. *In International Conference on Product-Focused Software Process Improvement* (pp. 307-323). Springer, Cham.	Uludag, O., Kleehaus, M., Xu, X., & Matthes, F. (2017). Investigating the Role of Architects in Scaling Agile Frameworks. *Chair for Informatics 19*	Gustavsson, T. (2018). Practices for vertical and horizontal coordination in the Scaled Agile Framework. *27th International Conference of Information Systems Development*, ISD2018 Lund, Sweden.	Bass, J.M. (2014). Scrum Master Activities: Process Tailoring in Large Enterprise Projects. *Proceedings of the 2014 IEEE 9th International Conference on Global Software Engineering*, 18-21, 6-15.	Sachdeva, S. (2016). Scrum Methodology. *International Journal Of Engineering And Computer Science*, 5 (6), 16792-16799.
Team leadership: Ability to build a high-performing team. Lead and coach team members through all sprints/iterations and phases of the project using the Agile/Scrum process. Strong empathic skills to create a collaborative atmosphere.	x	x	x	x	x	x	x
Facilitation of rituals: Organize and facilitate daily stand-ups, reviews, retrospectives, sprint/release planning, demos, and other Scrum-related meetings so that they are effective.	x	x	x	x	x	x	x
Guard agile principles: I ensure that the development teams are practicing core agile processes, principles, and rules.	x	x	x	x	x	x	x
Continous improvement: I spend time investigating and removing impediments for the development team.	x	x	x	x	x	x	x
Transparency: I inform the Product Owner and other stakeholders of the current status of development work. I use various tools and other information radiators to visualize progress, relevant metrics and ensure a smooth flow of value.	x	x	x			x	
Ensure that project is delivered on time and budget							
Allocate day-to-day responsibilities in team							
Evaluate performance of individuals in project team							

Motivational Characteristics Measures: The selected variables were measured using survey items that have been validated in previous studies. A five-point Likert scale was used to measure all items for the selected variables. The scale ranged from 1 (Strongly Disagree) to 5 (Strongly Agree). The reason for selecting two different scales for the chosen items is to facilitate comparison with existing literature without deviating from it.

The five main job dimensions of the motivational characteristics are taken from Morgeson and Humphrey's 2006 expanded job design theory. All the items of these dimensions were measured on a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). To evaluate the impact of the characteristics on job satisfaction, motivation, role ambiguity, and conflict, participants were asked about their perceived level of job autonomy, task significance, task identity, skill variety, and feedback from the job.

Autonomy: Items are related to the freedom employees have in carrying out their work and were subdivided into three aspects

Work scheduling autonomy: This three-item measure consisted of questions about whether the job allows for autonomy in controlling work hours, planning tasks, and choosing the order of completion.

Decision-making autonomy: This variable was measured with three items, and participants were asked about their perception of decision-making and use of personal judgment in job tasks.

Work methods autonomy: This variable was measured with three items, and participants were asked about their perception of independence and freedom of how they do their work and freedom to use their methods to complete work.

Task Significance: This variable was measured with four items, and participants were asked how their work results affect others or people outside the organisation.

Task Identity: This variable comprises four items, asking participants if the job allows them to complete a task from start to finish.

Skill Variety: This variable consisted of four items asking participants if the job allowed them to use various skills or high-level skills to complete the work.

Feedback From Job: This was a three-item measure reflecting on how the job provides feedback for work performance or information about the participants' job performance effectiveness.

Attitudinal Outcomes Measure: Existing validated survey items from (Hackman et al., 1974) were used to measure the selected variables. All the items for the selected variables were measured on a seven-point Likert scale. The reason for selecting two different scales for the chosen items is to facilitate comparison with existing literature without deviating from it.

Specific Satisfaction: This fourteen-item variable has short scales that tap several specific aspects of the employee's job satisfaction adapted from the Hackman theory, 1974. For each item, a seven-point scale was used, which ranges from "Extremely Dissatisfied" through "Neutral" to "Extremely Satisfied."

Pay Satisfaction: This consisted of two items (2 and 9) where participants were asked about the fair pay and benefits they received for their contribution to the organisation.

Security Satisfaction: This consisted of two items (1 and 11) reflecting on how secure things looked for the participants in the future of the organisation.

Social Satisfaction: Consisted of three items (4, 7 and 12) reflecting on how participants get to know, talk, or help others while at work.

Supervisory Satisfaction: This consisted of three items (5, 8, and 14) reflecting on how much respect, fair treatment, support, and guidance participants received from their supervisor in their work.

Growth Satisfaction: This four-item (3, 6, 10 and 13) measure asked participants about personal growth and development opportunities and their ability to exercise independent thoughts and actions in their jobs.

Internal Work Motivation: This was a four-item measure where a seven-point scale was used for each item, which ranges from "Disagree Strongly" through "Neutral" to "Agree Strongly." Participants were asked about the degree to which they are self-motivated to perform effectively on the job.

Role Perception Outcomes Measure: This measure is based on the work of (Rizzo et al., 1970). They created a 30-item survey to evaluate role ambiguity and role conflict. The survey comprised 15 items related to role ambiguity (even numbers) and 15 items related to role conflict (odd numbers). However, some of the items were complex items with lower loadings, and only items loading greater than .30 were considered by this study.

Role Ambiguity: This measure is explained as the lack of clarity and certainty in role expectations and outcomes. This variable was measured by six items (9 to 14) asking participants about their authority, clear, planned goals for their job, and knowledge of their responsibilities and expectations. Participants rated each statement on a scale of 1 (very false) to 7 (very true).

Role Conflict: The measure is defined as the degree of mismatched expectations associated with a role. This measure was based on eight items (1 to 8) asking participants if they worked on unnecessary things, receive incompatible requests, or receive assignments without the manpower to carry out assignments. Participants rated each statement on a scale of 1 (very false) to 7 (very true).

Team Performance: Team performance can be evaluated in terms of effectiveness and efficiency, as described by Hoegl and Gemuenden. Effectiveness measures the extent to which the team meets the expected quality standards for the results. In software development, the effectiveness of a product is determined by predetermined qualitative characteristics such as functionality, robustness, dependability, and performance. On the other hand, the team's efficiency is evaluated regarding sticking to schedules and budgets. To evaluate the team-level performance with the self-assessment, the Hoegl and Gemuenden scale was taken, which included 10 items for effectiveness and 5 for efficiency. Participants answered each statement on a scale of 1(Strongly Disagree) to 5 (Strongly Agree).

4.1.2 Data Collection

A research question was created to investigate how agile roles are implemented in practice and how this influences personal and work behaviour in organisations that adopt scaled agile. A survey was designed to collect the data to answer this question.

The survey's target group was practitioners working in agile software development teams with roles such as Software Developer, Scrum Master, Product Owner, Product Manager, RTE, Line Manager, etc. Furthermore, direct outreach was made to relevant practitioners to guarantee sample representativeness. This was done simultaneously targeting relevant companies while ensuring that various seniority levels were covered.

The collection period spanned eight weeks, from 31 October to 6 January 2024. 210 participants started the survey, and 102 completed it during this time frame, resulting in a response rate of 48,57%. I contacted participants through my connections and requested that they complete the survey and share it with their connections. Other external channels, such as LinkedIn and email, were utilised to share the survey. As each response was anonymous, it was impossible to identify its source.

First, the data was exported from the Qualtrics environment to Excel for cleaning, preparation, and descriptive analyses. The data was then imported into JASP for correlation and mediation tests and display.

5 Data Analysis & Results

In this section, the data that has been collected will be analysed. Several statistical analyses will be performed on the data gathered through surveys. Two main tools are used for data analysis, namely Excel and JASP. Excel is widely used for simple data analysis and preparation. The data and variables will be prepared in Excel and later imported into JASP, which is a statistical analysis tool.

The descriptive analysis was performed in Excel to create various diagrams and tables in the first paragraph to illustrate the number of responses, role distribution, organisation size, years of working experience and years of working experience with agile frameworks. In the second paragraph, a contextual analysis was conducted. Tables and diagrams, created in Excel, were used to illustrate the allocation of roles, distribution of role responsibilities, pay scale differences between roles, as well as the responsibility and accountability of results of a team sprint between product owners and team members. Additionally, the analysis explores goal conflicts and task interdependencies between the scrum master and product owner. Finally, a standard deviation analysis of the motivational characteristics and outcomes was conducted in JASP. The final paragraph discusses the correlation between different characteristics and outcomes. This was performed in Jasp, while a table of motivational characteristics and outcomes data was created in Excel to recognise trends across the roles.

The variables listed in Table 3 were created beforehand to analyse the data for the conceptual model in Figure 9.

Variable Name	**Description**
	AVG (Average)
AVG-TP	Team Performance
AVG-Auto	Autonomy
AVG-TS	Task Significance
AVG-TI	Task Identity
AVG-SV	Skill Variety
AVG-FFJ	Feedback From Job
AVG-IWM	Internal Work Motivation
AVG-Pay_S	Pay Satisfaction
AVG-Sec_S	Security Satisfaction
AVG-Soc_S	Social Satisfaction
AVG-Sup_S	Supervisory Satisfaction
AVG-Gro_S	Growth Satisfaction
AVG-Role_Con	Role Conflict
AVG-Role_Amb	Role Ambiguity

Table 3 Variable Codes and Descriptions

5.1 Descriptive Analysis

This section will show traits of role distribution, organisation size, years of working experience across agile roles, and agile methods.

5.1.1 Role Distribution

The current role of the participant within their organisation was asked using an open-ended question. The job roles included Scrum Master, Product Owner, Team Member, Product Manager/Chief Product Owner, Release Train Engineer, System Architect, and Line Manager. All the respondents had a role in the agile domain, and according to the data, the four largest groups of respondents were 22 Scrum Masters, 20 Line managers/ Group Leads, 17 Product Owners, and 15 Team Members. The remaining respondents were 10 Release Train Engineers, 7 Product Managers/Chief Product Owners, and 8 other roles like Agile coach and project manager.

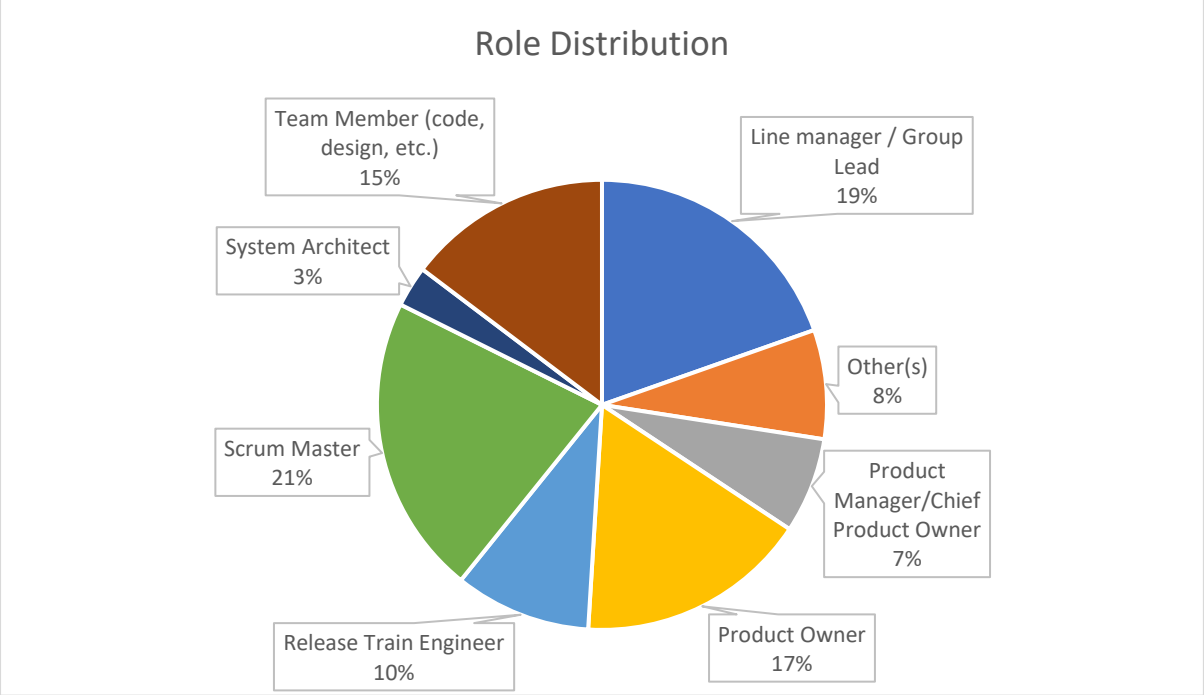


Figure 10 Role Distribution across the Respondents

5.1.2 Size of Organization and Demographics

The largest group of respondents were employed at an organisation greater than 1000 employees (32%), followed by 5001 – 20.000 employees (31%) and 10 - 250 employees (15%). According to Table 5, most respondents were based in European countries, mainly in the Netherlands.

Organisation Size	Participants	Percentage
10 - 250 employees	14	15%
251 - 1000 employees	11	11%
1001 - 5000 employees	31	32%
5001 - 20.000 employees	30	31%
20.001 - 50.000 employees	9	9%
> 50.001 employees	1	1%

Table 4 Organization Size of Respondents

Country	Participants	Percentage
Netherlands	79	77%
Belgium	8	8%
Danmark	5	5%
Germany	3	3%
Ireland	1	1%
England	1	1%
Norwegian	1	1%
Austria	1	1%
Suriname	1	1%
United States	2	2%

Table 5 Demographics of Respondents

5.1.3 Years of Working Experience Across Roles

The participants were asked to indicate their years of working experience in current and other roles. The average of the combined working experience of all the roles that have worked as a line manager is 6,5 years. The same applies for all the roles. Other(s) roles included Project Manager, Agile Coach, Team Lead, and Epic Owner.

Role	Average of Combined Working Experience of the Roles (Years)
Line Manager / Group Lead	6,5
Other(s)	11,1
Product Manager/Chief Product Owner	3,8
Product Owner	3,6
Release Train Engineer	2,7
Scrum Master	4,2
System Architect	4,9
Team Member (code, design, etc.)	5,7

Table 6 Average combined Work experience of all roles in a specific role.

5.1.4 Years of Working Experience with Agile Frameworks

Participants had the option of selecting multiple answers for the question since several agile methods are available. As a result, the figures are greater than the number of participants.

Most of the participants, 96, have experience with the Scrum framework, with an average of 6.1 years of work. 71 participants have experience with the Kanban framework, with an average of 4,3 years. 57 participants have experience with SAFe, with an average of 3,6 years.

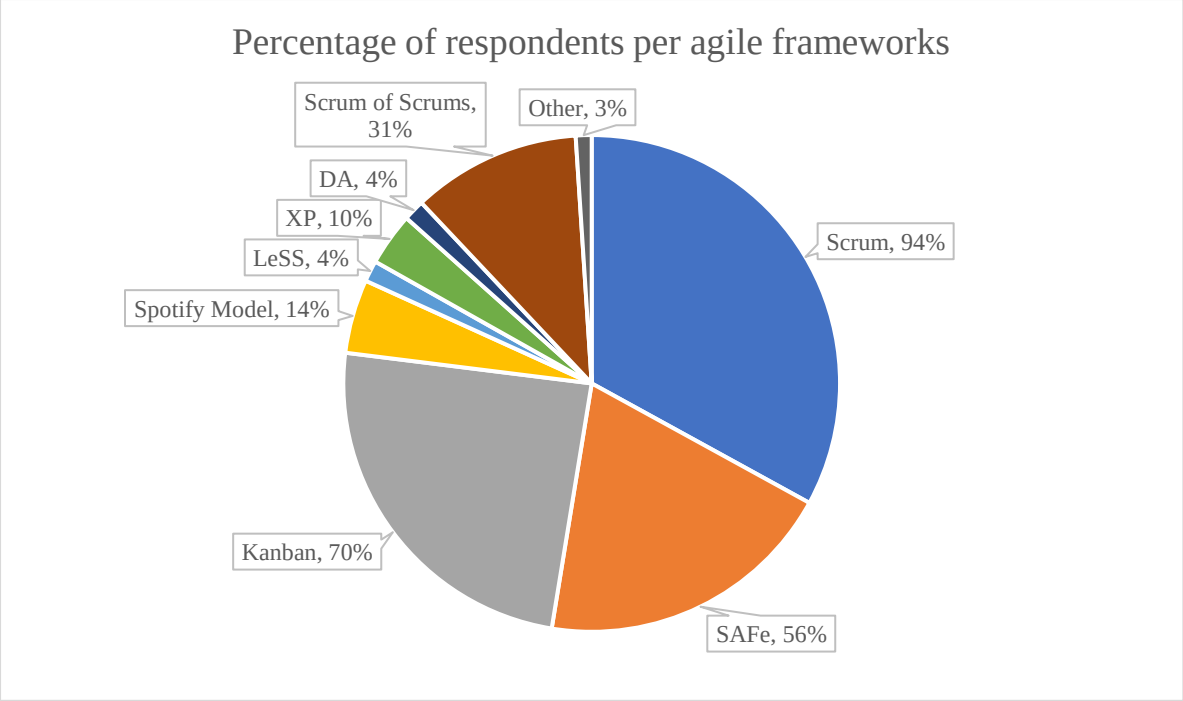


Figure 11 Percentage of Respondents per Agile Framework

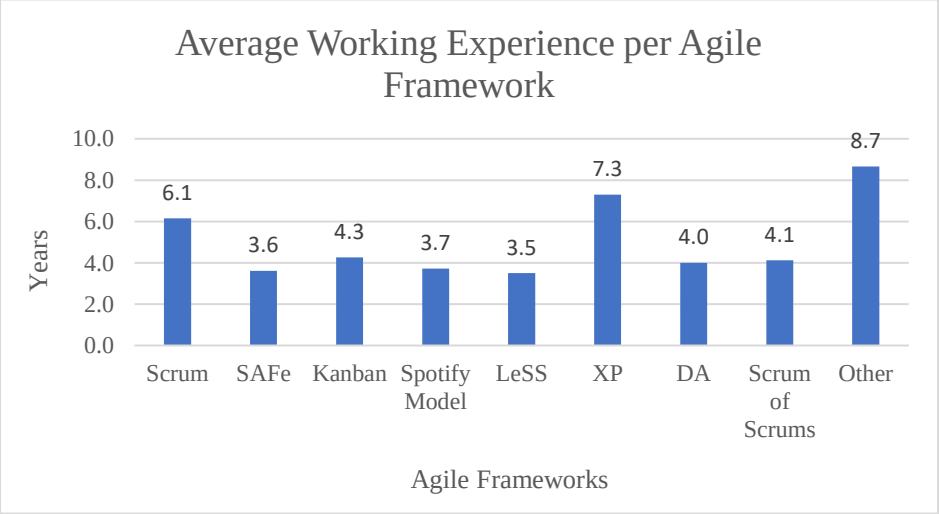


Figure 12 Average Working Experience per Agile Framework

5.2 Role Contextual Analysis

In this section, tables and diagrams were created in Excel to illustrate the allocation of roles, distribution of role responsibilities, pay scale differences between roles, as well as the responsibility and accountability of results of a team sprint between product owners and team members. Additionally, the analysis explores goal conflicts and task interdependencies between the scrum master and product owner. Finally, a standard deviation analysis of the motivational characteristics and outcomes was conducted in JASP.

5.2.1 Role Allocation Relation with Internal Work Motivation and Team Performance

The respondents were asked what the level of their role allocation was, which was connected to their internal work motivation and team performance. Scrum Masters who worked on their job 100% of the time had an average score of 6,33 for internal work motivation and a team performance score of 3,60. On the other hand, Scrum Masters who worked on their job 33% of the time had an average score of 5,25 for internal work motivation and a team performance score of 3,73.

Role	Role Allocation
Line Manager / Group Lead	95%
Other(s)	84%
Product Manager/Chief Product Owner	97%
Product Owner	88%
Release Train Engineer	82%
Scrum Master	90%
System Architect	90%
Team Member (code, design, etc.)	94%

Table 7 Percentage of Role Allocation of the Agile Roles

Number of Participants	Role	Role Allocation	AVG-TP	AVG-IWM
18	Scrum Master	100%	3,60	6,33
1	Scrum Master	60%	3,67	
2	Scrum Master	40%	3,77	6,54
1	Scrum Master	33%	3,73	5,25
10	Product Owner	100%	3,61	6,35
1	Product Owner	90%	3,73	6,25
1	Product Owner	85%	3,87	5,75
1	Product Owner	82%	3,73	6,50
1	Product Owner	70%	3,33	7,00
1	Product Owner	67%	3,33	6,50
1	Product Owner	60%	3,13	5,00
1	Product Owner	50%	3,82	7,00

Table 8 Percentage of Role Allocation relation to AVG-TP and AVG-IWM

Number of Participants	Role	Role Allocation	AVG-TP	AVG-IWM
6	Product Manager/CPO	100%	3,57	6,29
1	Product Manager/CPO	80%	4,20	7,00
5	Release Train Engineer	100%	3,51	6,32
1	Release Train Engineer	81%	3,33	6,00
1	Release Train Engineer	80%	2,93	6,25
1	Release Train Engineer	60%	3,00	7,25
2	Release Train Engineer	50%	3,56	6,33

Table 9 Percentage of Role Allocation relation to AVG-TP and AVG-IWM

5.2.2 Distribution of Responsibilities across Roles

Participants were asked to fill in the responsibilities for the respective roles. According to the majority of respondents, the Scrum Master is responsible for team leadership, facilitating rituals, upholding agile principles, promoting transparency, continuous improvement, and evaluating performance. The product owner is responsible for delivering the product vision, delivering the project on time and budget, managing the team's backlog, collaborating with team members and stakeholders, and communicating with end-users. The team members are responsible for their day-to-day work allocation, transparency, and developing solutions.

The majority of the respondents indicated that the Release Train Engineer is responsible for leadership, facilitating rituals, guarding agile principles, continuous improvement, and day-to-day work allocation. The Product Manager/CPO is responsible for various aspects related to product development. These include maintaining transparency throughout the product development process, effective planning, ensuring timely delivery of projects within the allocated budget, delivering the product vision, leading the team with a clear product vision and purpose, managing the product backlog, collaborating effectively with both the team and stakeholders, maximising product value, and having a good understanding of the business. The Line Manager is responsible for leadership, recruiting, developing, retaining capable individuals, evaluating performance, and managing compensation, benefits, and promotions.

The standard deviation (< 0) of the data is relatively low, indicating that the data is more clustered around the mean and has low variability. Indicating that the respondents provided more similar answers than diverse ones.

A standard deviation higher than 1 indicates that the answers have a greater degree of variation or diversity.

For an elaborative explanation of the responsibilities, please Appendix D.

Responsibilities	Scrum Master	Product Owner	Team Member	Other	Variance	Standard Deviation
Team leadership	52,35% (N=78)	25,50% (N=38)	11,41% (N=17)	10.74% (N=16)	0,873	0,934
Facilitation of rituals	68,66% (N=92)	14,93% (N=20)	14,18% (N=19)	2,24% (N=3)	0,673	0,820
Guard agile principles	69,01% (N=98)	14,08% (N=20)	13,38% (N=19)	3,52% (N=5)	0,734	0,857
Continuous improvement	47,09% (N=81)	25,58% (N=44)	22,09% (N=38)	5,23% (N=9)	0,885	0,941
Transparency	42,77% (N=71)	10,84% (N=18)	40,36% (N=67)	6,02% (N=10)	1,069	1,034
Delivery responsibility	18,18% (N=30)	44,85% (N=74)	30,30% (N=50)	6,67% (N=11)	0,688	0,829
Day-to-day work allocation	26,52% (N=35)	19,70% (N=26)	50,00% (N=66)	3,79% (N=5)	0,826	0,909
Create and own product vision	3,25% (N=4)	76,42% (N=94)	11,38% (N=14)	8,94% (N=11)	0,440	0,663
Manage the team backlog	19,29% (N=27)	62,14% (N=87)	15,71% (N=22)	2,86% (N=4)	0,467	0,683
Collaborate with team	24,00% (N=42)	50,86% (N=89)	20,57% (N=36)	4,57% (N=8)	0,628	0,792
Collaborate with stakeholders	18,59% (N=29)	58,97% (N=92)	17,95% (N=28)	4,49% (N=7)	0,523	0,723
Evaluate performance	31,98% (N=55)	29,07% (N=50)	19,19% (N=33)	19,77% (N=34)	1,238	1,113
Communicate with end-user	11,04% (N=18)	53,99% (N=88)	28,83% (N=47)	6,13% (N=10)	0,557	0,746
Develop the solution	6,67% (N=8)	11,67% (N=14)	77,50% (N=93)	4,17% (N=5)	0,385	0,620
Staffing decisions	24,45% (N=33)	30,61% (N=45)	8,16% (N=12)	38,78% (N=57)	1,467	1,211

Table 10 Distribution of Responsibilities across SM, PO, TM and Other in Percentage and variance across the responsibilities

Responsibilities	Release Train Engineer	Product Manager/ CPO	Line Manager	Other	Variance	Standard Deviation
Leadership	37,84% (N=42)	19,82% (N=22)	36,04% (N=40)	6,31% (N=7)	0,988	0.994
Facilitation of rituals	41,05% (N=39)	16,84% (N=16)	11,58% (N=11)	30,53% (N=29)	1,665	1,290
Guard agile principles	48,45% (N=47)	13,40% (N=13)	16,49% (N=16)	21,65% (N=21)	1,518	1,232
Continuous improvement	34,78% (N=48)	28,26% (N=39)	24,64% (N=34)	12,32% (N=17)	1,074	1,036
Transparency	31,54% (N=41)	43,08% (N=56)	17,69% (N=23)	7,69% (N=10)	0,806	0,898
Planning	28,24% (N=37)	41,22% (N=54)	18,32% (N=24)	12,21% (N=16)	0,940	0,970
Delivery responsibility	19,49% (N=23)	50,00% (N=59)	17,80% (N=21)	12,71% (N=15)	0,832	0,912
Day to day work allocation	25,74% (N=26)	18,81% (N=19)	20,79% (N=21)	34,65% (N=35)	1,452	1,205
Create and own product vision	4,76% (N=5)	72,38% (N=76)	18,10% (N=19)	4,76% (N=5)	0,370	0,609
Lead through product vision and purpose	8,18% (N=9)	62,73% (N=69)	23,64% (N=26)	5,45% (N=6)	0,471	0,686
Manage the team backlog	11,43% (N=12)	58,10% (N=61)	10,48% (N=11)	20,00% (N=21)	0,875	0,935
Collaborate with team	21,13% (N=30)	40,14% (N=57)	20,42% (N=29)	18,31% (N=26)	1,026	1,013
Collaborate with stakeholders	16,03% (N=21)	54,20% (N=71)	22,14% (N=29)	7,63% (N=10)	0,646	0,804
Maximize value	13,45% (N=16)	63,03% (N=75)	15,97% (N=19)	7,56% (N=9)	0,570	0,755
Business affinity	10,43% (N=12)	53,91% (N=62)	16,52% (N=19)	19,13% (N=22)	0,845	0,919
Grow talent	16,96% (N=19)	15,18% (N=17)	58,93% (N=66)	8,93% (N=10)	0,765	0,875
Evaluate performance	17,78% (N=24)	21,48% (N=29)	48,89% (N=66)	11,85% (N=16)	0,847	0,920
Compensation management	6,59% (N=6)	7,69% (N=7)	73,63% (N=67)	12,09% (N=11)	0,459	0,677

Table 11 Distribution of Responsibilities across RTE, PM, LM and Other in Percentage and Variance across the responsibilities

5.2.3 Pay Scale Relation to Satisfaction

The participants were asked to specify the pay grade range between the following roles: Scrum Master, Product Owner, Team member, Product Manager/CPO, Release Train Engineer, System Architect, and Line Manager. The objective is to understand the relationship between job grades in agile roles, especially the differences across the roles. The pay grade difference between Scrum Master and Product Owner, Product Manager and Release Train Engineer is compared and related to their satisfaction and internal work motivation. The majority of respondents reported little or no difference in pay between the two roles, as can be seen in Tables 12 and 15. In Tables 13 and 14, the satisfaction and internal work motivation of Scrum Masters and Product Owners have been analysed. The analysis revealed that Scrum Masters who reported no pay difference between themselves and the Product Owners have a higher level of satisfaction and motivation compared to those who reported a pay difference of 1. Meanwhile, the Product Owners who reported a pay difference of 1 have a higher level of satisfaction and motivation. In Tables 16 and 17, the satisfaction and internal work motivation of Product Managers and Release Train Engineers have been analysed. The analysis revealed that Product Managers who have reported zero pay difference between themselves and the Release Train Engineers have a higher level of satisfaction and motivation. Meanwhile, Release Train Engineers who reported a pay difference of one have a higher level of satisfaction and motivation.

Scrum Master vs Product Owner			
Respondents	Delta Paygrade	AVG-Satisfaction	AVG-IWM
27	0	5,55	5,57
26	1	5,51	5,55
5	2	5,60	5,56
1	3	6,00	5,75
2	4	5,68	5,56

Table 12 Pay Scale difference between SM and PO reported by all Respondents and relation to their Sat and IWM

Scrum Master (SM)			
Respondents	Delta Paygrade	AVG-Sat	AVG-IWM
5	0	5,61	6,10
6	1	5,05	5,54

Table 13 Pay Scale difference between SM and PO reported by SM and relation to their Sat and IWM

Product Owner (PO)			
Respondents	Delta Paygrade	AVG-Sat	AVG-IWM
4	0	5,39	5,63
4	1	6,13	5,75
2	2	4,46	4,50
1	3	6,00	5,00

Table 14 Pay Scale difference between SM and PO reported by PO and relation to their Sat and IWM

Product Manager vs Release Train Engineer			
Respondents	Delta Paygrade	AVG-Satisfaction	AVG-IWM
17	0	5,59	5,56
13	1	5,54	5,55
6	2	5,58	5,56
2	3	5,60	5,53
1	4	5,07	5,25
1	7	3,14	4,00

Table 15 Pay Scale difference between PM and RTE reported by all respondents

Product Manager			
Respondents	Delta Paygrade	AVG-Sat	AVG-IWM
1	0	5,79	5,00
1	3	4,50	4,25

Table 16 Pay Scale difference between PM and RTE reported by PM and relation to their Sat and IWM

Release Train Engineer			
Respondents	Delta Paygrade	AVG-Sat	AVG-IWM
4	0	4,80	5,88
3	1	6,12	6,08

Table 17 Pay Scale difference between PM and RTE reported by RTE and relation to their Sat and IWM

5.2.4 Responsibility and Accountability of Results of Team Sprint Relation to Team Performance

Participants were asked who in their organisation is responsible for delivering and accountable for the results of a team sprint/iteration. To clarify, responsibility refers to who is responsible for the delivery of the work, while accountability pertains to who approves or accepts the delivered work. These responses were analysed and connected to their team performance. 62 respondents indicated that the team is responsible for the results of a team sprint, and their average team performance is 3,57. 50 respondents indicated that the Product Owner is accountable for the results of the team sprint, with an average team performance score of 3,57. It also analysed the accountability for results between the Scrum Master and the Product Owner. The respondents who reported that the Product Owner should be accountable for results delivery had slightly higher team performance scores and slightly lower motivation scores.

Roles	**Responsibility**	**AVG-TP**		**Accountability**	**AVG-TP**
Other role(s)	4%	3,61		7%	3,62
Product Owner	25%	3,59		50%	3,57
Scrum Master	10%	3,56		19%	3,57
Team	61%	3,57		25%	3,57

Table 18 Percentage of roles Responsibility and Accountability of results of team sprint

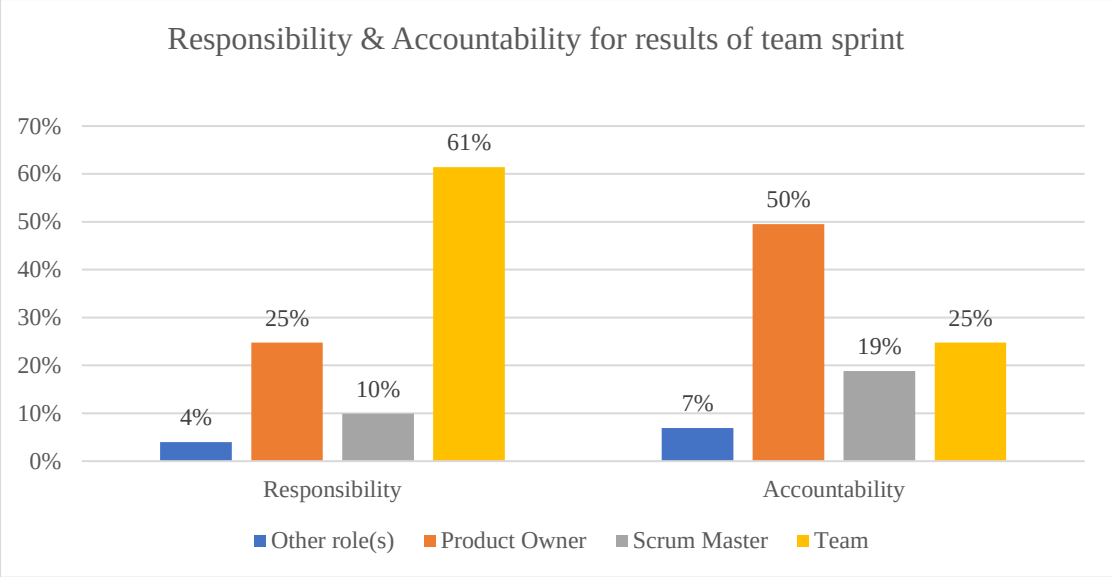


Figure 13 Percentage of roles responsibility and accountability of results of team sprint

Accountability for Results		
	Scrum Master (N=19)	Product Owner (N=50)
AVG-TP	3,55	3,67
AVG-IWM	5,50	5,34

Table 19 Comparison of AVG-TP and AVG-IWM between respondents who indicated that SM should be accountable for delivery results vs those who indicated that PO should be accountable for delivery results

5.2.5 Goal Conflict and Task Interdependency across Product Owner and Scrum Master Roles

Participants were asked to indicate the extent to which the Scrum Master and Product Owner roles main goals conflicted and tasks intertwined, using a low, medium, and high scale.

On average, 99 respondents reported a degree of task interdependence of 1.80 and a degree of goal conflict of 1.65. Figure 15 shows the number of respondents for each scale of task interdependency and goal conflict: low (33), medium (53), and high (13).

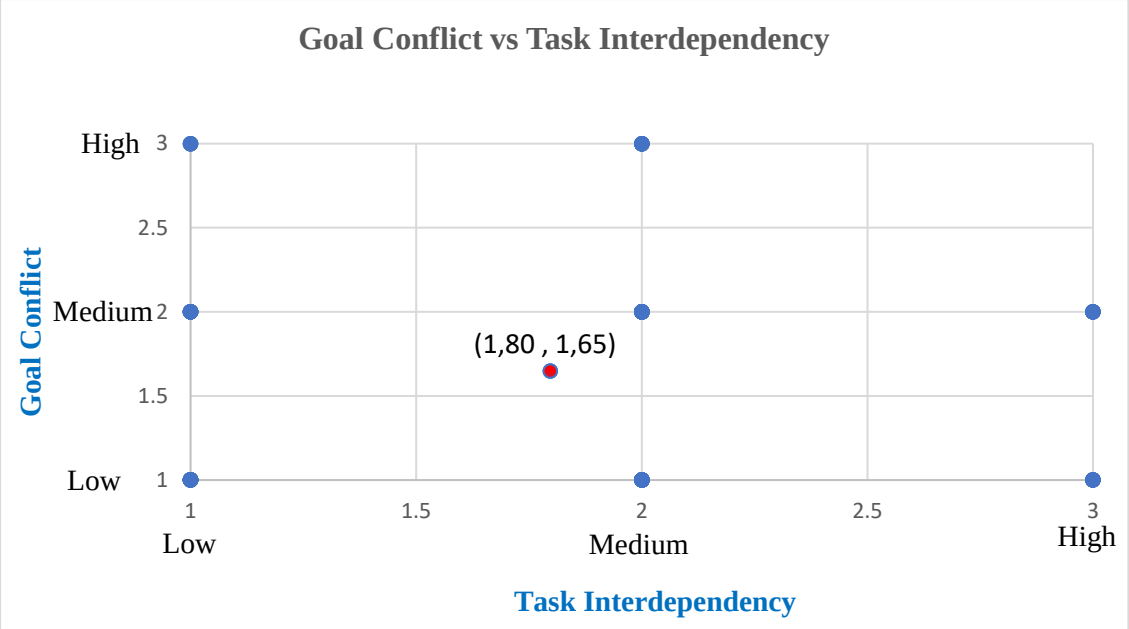


Figure 14 Goal Conflict vs Task Interdependency between PO and SM roles

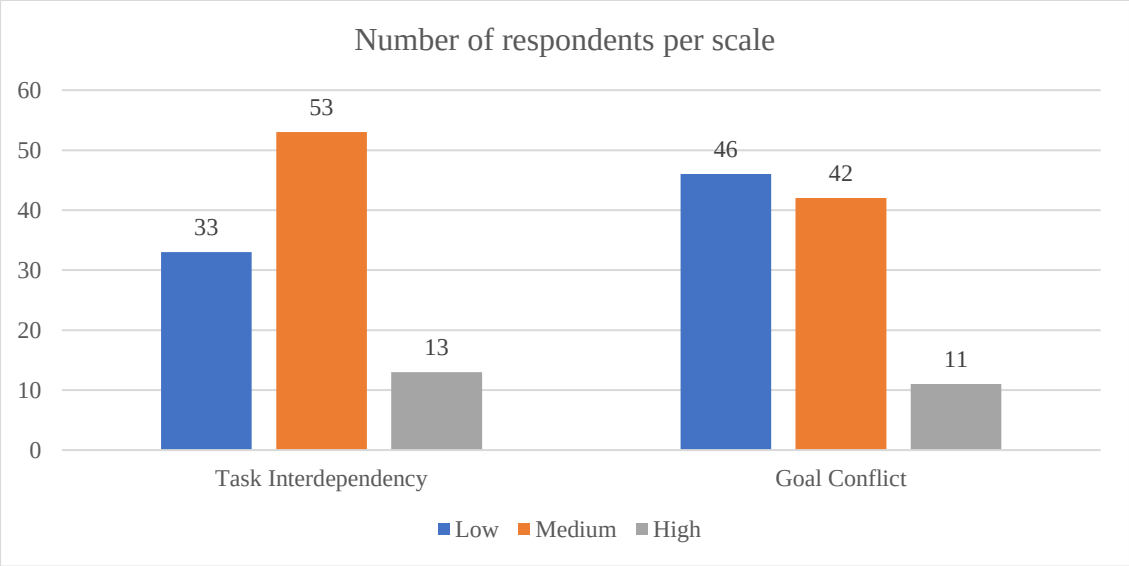


Figure 15 Number of Respondents per scale

5.2.6 Standard Deviation and Mean Analysis

The results in Table 20 show comparable mean and median, suggesting a reasonable degree of symmetry in the data distribution. The mode represents the most frequently occurring number in the sample dataset, which ranges from one to five, as a Likert five-scale was used. The data has low variability, indicated by a relatively low standard deviation compared to the mean, showing that it is grouped around the mean.

	AVG-Aut	AVG-TS	AVG-TI	AVG-SV	AVG-FFJ	AVG-TP
Valid	102	101	101	100	101	102
Missing	2	3	3	4	3	2
Mode	3.99[a]	3.09	3.91	3.98[a]	3.97[a]	3.86[a]
Median	4.00	3.25	3.50	4.25	3.67	3.72
Mean	4.13	3.40	3.35	4.40	3.45	3.57
Std. Deviation	0.59	0.73	0.90	0.51	0.86	0.56
Minimum	2.44	1.75	1.00	3.00	1.33	1.67
Maximum	5.00	5.00	5.00	5.00	5.00	4.80

[a] More than one mode exists. For nominal and ordinal data, the first mode is reported.

Table 20 Descriptive Statistics for the Motivational Characteristics and Team Performance

The results in Table 21 show comparable mean and median, suggesting a reasonable degree of symmetry in the data distribution. The mode represents the most frequently occurring number in the sample dataset, which ranges from one to seven, as a Likert seven-scale was used. The data has low variability, indicated by a relatively low standard deviation compared to the mean, indicating that it is grouped around the mean.

	AVG-Pay_S	AVG-Sec_S	AVG-Soc_S	AVG-Sup_S	AVG-Gro_S	AVG-IWM	AVG-Role_Con	AVG-Role_Amb
Valid	102	102	102	102	102	101	100	100
Missing	2	2	2	2	2	3	4	4
Mode	5.41[a]	5.62[a]	5.81[a]	5.16[a]	5.43[a]	5.98[a]	3.48	5.84
Median	5.33	5.62	5.78	5.10	5.30	5.50	4.00	5.33
Mean	5.27	5.62	5.71	5.00	5.20	5.52	3.98	5.24
Std. Deviation	0.23	0.06	0.22	0.27	0.36	0.84	1.17	0.91
Minimum	4.63	5.39	4.33	4.15	3.94	3.50	1.00	2.67
Maximum	6.25	5.80	5.87	5.28	5.63	7.00	6.38	7.00

[a] More than one mode exists. For nominal and ordinal data, the first mode is reported.

Table 21 Descriptive Statistics for the Outcomes

In Table 22 are the means of the measures as reported in the related literature. it can be observed that the motivational characteristics of the survey data are somewhat similar to the averages found in existing literature. For instance, autonomy and skill variety are relatively higher compared to task significance, task identity, and feedback from the job.

After comparing the survey data with the existing literature, it can be observed that the satisfaction outcome averages are slightly higher than those reported in the literature. However, the internal work motivation levels are similar to what has been reported before. The mean score for role conflict is similar to that of existing literature, and the role ambiguity scores from the survey data are relatively higher than those reported in the literature. The team performance average of the survey data is relatively lower than that of the literature.

(Morgeson et al., 2006)	
*	**Mean**
autonomy	4,01
Task Significance	3,95
Task Identity	3,61
Skill Variety	4,24
Feedback from Job	3,91
(Hackman et al., 1978)	
**	**Mean**
Pay Satisfaction	4,16
Security Satisfaction	4,76
Social Satisfaction	5,31
Supervisory Satisfaction	4,79
Growth Satisfaction	4,74
Internal Work Motivation	5,50
(Rizzo et al., 1970)	
**	**Mean**
Role conflict	3,86
role ambiguity	4,03
(Hoegl et al., 2001)	
*	**Mean**
Team Performance (Team Member)	3,84
Team Performance (Team Lead)	4,02
Team Performance (Manager)	4,04

Table 22 Means of the measures according to the literature

5.3 Correlation Results

This section presents the correlation results between motivational characteristics and outcomes such as satisfaction, internal work motivation, and role perception, which Hackman and Morgeson also examine. Furthermore, new correlation tests have been performed to assess the connection between team performance and role perception.

The **Pearson correlation coefficient (r)** is a popularly used method for measuring a linear correlation between two variables. It is a numerical value ranging from -1 to 1 that indicates both the strength and

direction of the relationship between these variables. When one variable changes, the other variable also changes in the same way. The strength of their relationship can be anywhere between -1 and +1, with stronger correlations approaching ±1.

The correlation coefficient (r) shows the strength of the relationship between two variables. The p-value, on the other hand, determines the likelihood of observing a correlation of this strength under the null hypothesis - e.g., under the assumption that your random variables are uncorrelated. If the p-value is low (generally less than 0.05), the correlation is statistically significant, and the calculated Pearson coefficient can be used.

The Pearson correlation coefficient should be used when (1) the relationship is linear, (2) both variables are quantitative, (3) they are normally distributed, and (4) there are no outliers.

Spearman's rho is a nonparametric measure that assesses the correlation between two variables' rankings by using a monotonic function. A Spearman correlation of 1 indicates a monotonic relationship between compared variables, regardless of whether the relationship is linear or not.

Spearman's test is a statistical method for analysing data at an ordinal or continuous level. Unlike other correlation tests, Spearman's correlation uses ranks instead of assuming normality, making it ideal for analysing data obtained from 3, 5, and 7-point Likert scale or ordinal survey questions.

The **Spearman's rho** was used to calculate correlations since the measurement scales are ordinal. The categorisation between the different correlation strengths can be seen on the left side of the table, and the right side of Table 23 shows the indicators for significance with their corresponding value used in this study, as proposed by Dancy & Reidy (Akoglu, 2018). Generally, a p-score below 0.05 is indicated as statistically significant and means there is a 95 percent chance that the null hypothesis is rejected and the results are not attained due to random variation.

Spearman’s rho	Correlation	Significance indicator	Meaning
>0.70	Very strong relationship	***	p <.001
0.40 - 0.69	Strong relationship	**	p <.01
0.30 - 0.39	Moderate relationship	*	p <.05
0.20 - 0.29	Weak relationship		
0.01 - 0.19	No or negligible relationship		

Table 23 The interpretation of Spearman’s correlation coefficient (rho)

5.3.1 Correlation Test between Motivational Characteristics and Attitudinal and Role Perception Outcomes

Below are the correlation results of the motivational characteristics with satisfaction, internal work motivation and role perception. It can be observed that there is no correlation between motivational characteristics and satisfaction and internal work motivation outcomes. However, this is likely due to the small sample size (n=102) of data collected solely from IT practitioners working with Agile methodology. In contrast, Hackman and Oldham collected data from a much larger sample of employees working across 876 jobs in 56 diverse organisations. Their study encompassed a diverse range of jobs, including those in professional, sales, clerical, and managerial roles, across government, service, and productive organizations situated in various regions of the United States. The five core job dimensions, skill variety, task identity, task significance, autonomy, and job feedback, are moderately positively intercorrelated (Hackman et al., 1975, 1978). Furthermore, these core dimensions and psychological states are strongly and positively associated with the outcome measures, such as overall satisfaction. The satisfaction level of employees has been found to be a predictor of both turnover and absenteeism, indicating that lower satisfaction often leads to higher turnover and absenteeism rates. On the other hand, internal work motivation has been found to have a direct impact on the quality of work performance.

Morgeson and Humphry collected data from 259 articles using a meta-analysis method, which also included various professions. The meta-analysis conducted by Humphrey et al. in 2007 found that the motivational characteristics were highly correlated with each other and had generally stronger relationships with outcomes. The study found that all five motivational characteristics have a positive correlation with job satisfaction, growth satisfaction, and internal work motivation (Humphrey et al., 2007). Additionally, all of the motivational characteristics were associated with supervisor satisfaction, coworker satisfaction, compensation satisfaction, and promotion satisfaction. Autonomy had the strongest relationship with these factors, except for promotion satisfaction, where feedback from the job was found to have the largest relationship. Lastly, the study found that only autonomy and feedback from the job were related to role ambiguity. In contrast, autonomy, feedback from the job, and task identity were associated with role conflict.

After analysing the survey data, it was observed that there is a significant correlation between autonomy and skill variety ($p < .001$) and a strong relationship between autonomy and task identity ($p = .003$) and Feedback from Job ($p = 0.004$). Task Significance has a moderate relationship with feedback from the job ($p = 0.043$). Moreover, task identity correlated significantly with feedback from job ($p < .001$) and has a moderate relationship with skill variety ($p = 0.034$).

Skill variety correlated significantly with internal work motivation ($p < .001$). Autonomy ($p = 0.031$) and feedback from the job ($p = 0.013$) have a negatively moderate relationship with role conflict, whereas task identity negatively correlates significantly ($p < .001$) with role conflict. Autonomy ($p = 0.005$), task identity ($p < .001$) and feedback from the job ($p < .001$) have a strong and significant connection with role ambiguity.

What can also be observed is that the satisfaction outcomes are significantly intercorrelated, except for security satisfaction.

Variable		AVG-Aut	AVG-TS	AVG-TI	AVG-SV	AVG-FFJ	AVG-Pay_S	AVG-Sec_S	AVG-Soc_S	AVG-Sup_S	AVG-Gro_S	AVG-IWM	AVG-Role_Con	AVG-Role_Amb
1. AVG-Aut	Spearman's rho	—												
	p-value	—												
2. AVG-TS	Spearman's rho	0.144	—											
	p-value	0.150	—											
3. AVG-TI	Spearman's rho	0.292**	0.020	—										
	p-value	0.003	0.841	—										
4. AVG-SV	Spearman's rho	0.368***	0.186	−0.212*	—									
	p-value	< .001	0.064	0.034	—									
5. AVG-FFJ	Spearman's rho	0.286**	0.202*	0.387***	0.129	—								
	p-value	0.004	0.043	< .001	0.200	—								
6. AVG-Pay_S	Spearman's rho	0.077	0.089	0.172	0.027	0.175	—							
	p-value	0.443	0.378	0.086	0.786	0.081	—							
7. AVG-Sec_S	Spearman's rho	−0.023	−0.041	0.005	0.024	0.145	−0.016	—						
	p-value	0.815	0.682	0.958	0.809	0.148	0.875	—						
8. AVG-Soc_S	Spearman's rho	0.115	0.117	0.152	0.099	0.233*	0.752***	0.091	—					
	p-value	0.248	0.244	0.130	0.328	0.019	< .001	0.363	—					
9. AVG-Sup_S	Spearman's rho	0.113	0.080	0.189	0.082	0.245*	0.815***	0.088	0.948***	—				
	p-value	0.259	0.426	0.058	0.416	0.014	< .001	0.381	< .001	—				
10. AVG-Gro_S	Spearman's rho	0.175	0.127	0.188	0.104	0.196*	0.874***	0.020	0.881***	0.918***	—			
	p-value	0.079	0.206	0.059	0.303	0.050	< .001	0.845	< .001	< .001	—			
11. AVG-IWM	Spearman's rho	0.173	0.118	0.070	0.363***	−0.017	−0.167	0.094	−0.059	−0.082	−0.013	—		
	p-value	0.084	0.242	0.484	< .001	0.867	0.095	0.348	0.556	0.416	0.900	—		
12. AVG-Role_Con	Spearman's rho	−0.216*	0.099	−0.390***	0.088	−0.247*	−0.036	−0.224*	−0.109	−0.125	−0.091	−0.172	—	
	p-value	0.031	0.327	< .001	0.386	0.013	0.722	0.025	0.279	0.216	0.368	0.087	—	
13. AVG-Role_Amb	Spearman's rho	0.282**	0.080	0.396***	0.047	0.434***	0.187	0.076	0.243*	0.269**	0.237*	0.150	−0.344***	—
	p-value	0.005	0.426	< .001	0.641	< .001	0.062	0.451	0.015	0.007	0.017	0.135	< .001	—

* p < .05, ** p < .01, *** p < .001

Table 24 Correlation table for Motivational Characteristics and the Outcomes

5.4 Motivational Characteristics and Outcomes across the Roles

Table 26 represents the motivational characteristics, satisfaction, internal work motivation and role perception outcomes scores per role. For each variable, blue indicates the highest score, while red indicates the lowest across the roles except for Role conflict. When measuring role conflict, a low score indicates little conflict, while a high score means greater conflict.

*	Five-point Likert Scale
**	Seven-point Likert Scale

Table 25 Likert Scale indications

It can be observed that the Release Train Engineer has lower scores on many dimensions compared to other roles, while Product Owner and Team Members have higher scores. Team Members and Product Owners have scored relatively higher than the other roles. The Scrum Master and Product Owner have scored relatively higher for Team Performance.

on an individual level, it can be observed that the motivational characteristics of the survey data are somewhat similar to the averages found in existing literature in Table 22.

it can be observed that the satisfaction levels of the respondents are slightly higher than those reported in the literature. However, the internal work motivation levels are similar to what has been reported before. The mean score for role conflict is similar to that of existing literature, except for the line managers and release train engineers. The role ambiguity scores from the survey data are relatively higher than those reported in the literature. The average team performance reported by the team members in the survey is somewhat similar to the team performance reported by team members in the literature in Table 26. However, the Scrum Master and Product Owner team performance averages in the survey data are lower than the literature team performance mean reported by Team Leads. Additionally, the survey data shows that the team performance average reported by Line Managers is also lower than the literature team performance mean reported by Managers.

		Scrum Master (N=22)	Product Owner (N=17)	Product Manager/CPO (N=7)	Release Train Engineer (N=10)	Line Manager (N=20)	Team Members (N=15)
autonomy	AVG-Aut *	4,09	4,16	4,14	4,09	4,15	4,15
Task Significance	AVG-TS *	3,35	3,40	3,38	3,35	3,40	3,40
Task Identity	AVG-TI *	3,29	3,40	3,35	3,29	3,36	3,40
Skill Variety	AVG-SV *	4,38	4,39	4,39	4,38	4,39	4,39
Feedback from Job	AVG-FFJ *	3,49	3,50	3,50	3,44	3,49	3,50
Pay Satisfaction	AVG-Pay_S **	5,48	5,46	5,47	5,43	5,46	5,49
Security Satisfaction	AVG-Sec_S **	5,59	5,62	5,62	5,61	5,58	5,63
Social Satisfaction	AVG-Soc_S **	5,93	5,95	5,88	5,87	5,88	5,93
Supervisory Satisfaction	AVG-Sup_S **	5,28	5,29	5,28	5,26	5,22	5,32
Growth Satisfaction	AVG-Gro_S **	5,62	5,62	5,59	5,47	5,55	5,59
Internal Work Motivation	AVG-IWM **	5,54	5,51	5,49	5,49	5,53	5,51
Role Conflict	AVG-Role_Con **	3,91	3,86	3,96	4,00	4,05	3,87
Role Ambiguity	AVG-Role_Amb **	5,35	5,37	5,29	5,22	5,28	5,38
Team Performance	AVG-TP *	3,60	3,62	3,60	3,57	3,60	3,61

Table 26 Motivational Characteristics and Outcomes across the Roles

To make Table 26 more readable, the averages have been converted into bipolar scales. For example, a five-point Likert scale (1 2 3 4 5) will be converted into -2 -1 0 1 2. A seven-point Likert scale (1 2 3 4 5 6 7) will be converted into -3 -2 -1 0 1 2 3.

		Scrum Master (N=22)	Product Owner (N=17)	Product Manager/CPO (N=7)	Release Train Engineer (N=10)	Line Manager (N=20)	Team Members (N=15)
autonomy	AVG-Aut *	1,09	1,16	1,14	1,09	1,15	1,15
Task Significance	AVG-TS *	0,35	0,40	0,38	0,35	0,40	0,40
Task Identity	AVG-TI *	0,29	0,40	0,35	0,29	0,36	0,40
Skill Variety	AVG-SV *	1,38	1,39	1,39	1,38	1,39	1,39
Feedback from Job	AVG-FFJ *	0,49	0,50	0,50	0,44	0,49	0,50
Pay Satisfaction	AVG-Pay_S **	1,48	1,46	1,47	1,43	1,46	1,49
Security Satisfaction	AVG-Sec_S **	1,59	1,62	1,62	1,61	1,58	1,63
Social Satisfaction	AVG-Soc_S **	1,93	1,95	1,88	1,87	1,88	1,93
Supervisory Satisfaction	AVG-Sup_S **	1,28	1,29	1,28	1,26	1,22	1,32
Growth Satisfaction	AVG-Gro_S **	1,62	1,62	1,59	1,47	1,55	1,59
Internal Work Motivation	AVG-IWM **	1,54	1,51	1,49	1,49	1,53	1,51
Role Conflict	AVG-Role_Con **	-0,09	-0,14	-0,04	0,00	0,05	-0,13
Role Ambiguity	AVG-Role_Amb **	1,35	1,37	1,29	1,22	1,28	1,38
Team Performance	AVG-TP *	0,60	0,62	0,60	0,57	0,60	0,61

Table 27 Motivational Characteristics and Outcomes across roles in bipolar scales

5.5 Factors that Distinguish Least Motivated and Highly Motivated Agile Roles

This section analyses the factors differentiating the least motivated agile roles from the highly motivated ones. Internal Work Motivation has been used as a criterion to filter out roles from least motivated to most motivated. The average score of each role's Internal Work Motivation has been used to divide them into two groups: least and highly motivated.

5.5.1 Scrum Master

The following section outlines the differentiating factors between low (N=11) and highly (N=11) motivated Scrum Masters.

Distinguishing Factors	Scrum Master
Team Leadership	The least motivated Scrum Masters indicated different roles responsible for team leadership, while the highly motivated ones indicated that it was their task.
Day-to-day Work Allocation	The least motivated Scrum Masters indicated that they, mainly the team and the product owner, were responsible for day-to-day work allocation. On the other hand, the most motivated Scrum Masters indicated that either they or the Team were responsible for it.
Communicate with End-user	Most of the Scrum Masters who were least motivated indicated that the Product Owner and Team Members communicated with the end user. However, the highly motivated Scrum Masters suggested that different roles were responsible for this task.
Pay Scale	Most low-motivated Scrum Masters provided no information about their pay scale or the Product Owners. However, those who did provide information reported either no difference or a difference in one pay scale level between themselves and the product owners. On the other hand, the majority of the highly motivated Scrum Masters did provide this information. It indicated a pay scale difference of zero or one between them and the Product Owners.

Table 28 Distinguishing factors for the least and highly motivated Scrum Masters

Motivational Characteristics:

It can be observed that the motivational characteristics of highly motivated Scrum Masters are higher than those of the least motivated product owners.

	AVG-IWM		AVG-Aut	AVG-TS	AVG-TI	AVG-SV	AVG-FFJ
Least	4,59		3,95	3,09	3,21	3,52	3,15
High	6,34		4,01	3,41	3,00	4,52	3,27

Table 29 Motivational Characteristics of the least and highly motivated Scrum Masters

5.5.2 Product Owner

The following section outlines the differentiating factors between low (N=8) and highly (N=9) motivated Product Owners.

Distinguishing Factors	Product Owner
Facilitation of Rituals	The least motivated Product Owners had differing opinions about the responsibility of facilitating rituals, whereas the highly motivated ones indicated that this was a task solely for the Scrum Master.
Guard Agile Principles	The Product Owners with lower motivation described different roles as responsible for guarding agile principles, while those with higher motivation indicated this was solely the responsibility of the Scrum Master.
Manage the Team Backlog	Product Owners with low motivation indicated different roles for managing the team backlog, while those with high motivation indicated that it was their responsibility.
Collaborate with Stakeholders	The Product Owners who were least motivated indicated that collaborating with stakeholders was only their responsibility. In contrast, some of the highly motivated ones indicated that it was also the team's responsibility, besides their own.
Pay Scale	The least motivated Product Owners reported varying differences in pay scale between them and the Scrum Master. On the other hand, the highly motivated Product Owners reported either zero or one difference in the pay scale.

Table 30 Distinguishing factors for the least and highly motivated Product Owners

Motivational Characteristics:

It can be observed that the motivational characteristics of highly motivated Product Owners are lower than those of the least motivated Product Owners.

	AVG-IWM		AVG-Aut	AVG-TS	AVG-TI	AVG-SV	AVG-FFJ
Least	4,84		4,44	3,50	3,44	4,34	3,75
High	5,94		3,91	3,47	3,42	4,33	3,19

Table 31 Motivational Characteristics of the least and highly motivated Product Owners

5.5.3 Product Manager

The following section outlines the differentiating factors between low (N=3) and highly (N=4) motivated Product Managers.

Distinguishing Factors	Product Manager
Delivery Responsibility	While the least motivated Product Managers indicated that the responsibility of delivery lies with the Release Train Engineer, the highly motivated ones indicated that this was their task.
Manage the Team Backlog	The less motivated product managers suggested that managing the team backlog was their responsibility along with the Line Manager, while the highly motivated Product Managers indicated that it was their responsibility along with the Release Train Engineer.
Grow Talent	The least motivated Product Managers indicated that different roles were responsible for growing talent. In contrast, the highly motivated Product Managers indicated that growing talent was their responsibility along with the Line Manager.
Compensation Management	The Product Managers with low motivation indicated that different roles were responsible for compensation management, whereas those with high motivation indicated that both themselves and the Line Manager were responsible.
Pay Scale	The Product Managers with the least motivation indicated a pay scale difference of either three or zero compared to the Release Train Engineer. In contrast, the most motivated ones did not provide any indication of the Engineer's pay scale.

Table 32 Distinguishing factors for the least and highly motivated Product Managers

Motivational Characteristics:

It can be observed that the motivational characteristics of highly motivated Product Managers are higher than those of the least motivated Product Managers.

	AVG-IWM		AVG-Aut	AVG-TS	AVG-TI	AVG-SV	AVG-FFJ
Least	4,83		4,15	3,25	3,25	3,00	3,44
High	6,31		4,47	4,44	3,25	4,75	3,75

Table 33 Motivational Characteristics of the least and highly motivated Product Managers

5.5.4 Release Train Engineer

The following section outlines the differentiating factors between low (N=5) and highly (N=5) motivated Release Train Engineers.

Distinguishing Factors	Release Train Engineer
Continuous Improvement	The least motivated RTEs stated that continuous improvement is mainly their task, whereas the most motivated ones indicated that this responsibility is shared among various roles.
Manage the Team Backlog	The least motivated RTEs indicated that managing the team backlog was solely the responsibility of the Product Manager. In contrast, the most motivated ones indicated it was the responsibility of the Product Manager and other roles.
Collaborate with Stakeholders	The least motivated RTEs stated that collaborating with stakeholders was mainly the Product Manager's task, whereas the most motivated ones indicated that this responsibility was shared among various stakeholders.
Work Experience	RTEs who were less motivated had less work experience compared to the highly motivated ones.
Role Conflict	The least motivated RTEs indicated high role conflict compared to the highly motivated ones.

Table 34 Distinguishing factors for the least and highly motivated Release Train Engineers

Motivational Characteristics:

By comparing the motivational characteristics scores of the least motivated RTEs with the highest motivated RTEs, it can be inferred that the highly motivated ones scored relatively higher.

	AVG-IWM		AVG-Aut	AVG-TS	AVG-TI	AVG-SV	AVG-FFJ
Least	4,75		3,78	3,00	2,75	3,90	3,20
High	6,25		4,38	3,20	3,50	4,80	3,87

Table 35 Motivational Characteristics of the least and highly motivated Release Train Engineers

5.5.5 Line Manager

The following section outlines the differentiating factors between low and highly motivated Line Managers.

Distinguishing Factors	Line Managers
Day-to-day Work Allocation	The Line Managers who were least motivated indicated that the responsibility for day-to-day work allocation was shared between themselves and the Release Train Engineers. On the other hand, highly motivated Line Managers indicated that different roles were responsible for this task.
Create and Own Product Vision	The Line Managers with low motivation suggested that the responsibility of creating and owning the product vision was shared among different roles, while the highly motivated ones indicated that this responsibility was shared between them and the Product Managers.
Lead through Product Vision and Purpose	The Line Managers with low motivation indicated that the responsibility of leading through product vision and purpose was assigned to different roles, while the highly motivated ones indicated that this responsibility was shared between them and the Product Managers.
Pay Scale	The Line Managers who were less motivated indicated that they were paid more than the Product Managers and Release Train Engineers. On the other hand, the Line Managers who were highly motivated reported either no difference in pay scale compared to the Product Manager and Release Train Engineer, a difference of one pay scale level between them and the Release Train Engineer, or a higher pay scale than both of these roles.

Table 36 Distinguishing factors for the least and highly motivated Line Managers

Motivational Characteristics:

It can be observed that three of the motivational characteristics of the highly motivated Line Managers are lower in comparison to those of the least motivated Line Managers. One characteristic is equal to the least motivated ones, while the other is higher.

	AVG-IWM		AVG-Aut	AVG-TS	AVG-TI	AVG-SV	AVG-FFJ
Least	5,03		4,21	3,43	3,40	4,58	3,60
High	6,08		4,21	3,35	3,35	4,60	3,20

Table 37 Motivational Characteristics of the least and highly motivated Line Managers

6 Discussion

This study aimed to investigate how agile roles are implemented in practice and how this impacts employees' personal and work behaviour in organisations that adopt scaled agile. The Agile frameworks have been present for some time and introduce new roles, but they do not provide sufficient guidance on how to implement these agile roles.

To answer the research question, a conceptual model was created to diagnose existing jobs of these roles. A survey was designed to gather data for this conceptual model.

The discussion section addresses the research question that was proposed earlier. In the upcoming sections, the key findings of this study will be discusses, with a focus on the main research question that forms the basis of the thesis:

"How are the Scrum Master, Product Owner, Product Manager, Release Train Engineer, and Line Manager roles implemented in practice, and how does it impact their personal and work behaviour?"

The guiding questions to help answer the research question:

- Should the Scrum Master and Product Owner, Product Manager and Release Train Engineer roles be separated?
- What are the pay scale recommendations for these roles?
- Who should be responsible for delivering the sprint results, and who is accountable for those results?

The main findings will also be linked with the previous studies where applicable.

In the first section, the key findings across the agile roles are discussed in three parts: 1) outcome trends across roles, 2) distinguishing factors per role that could lead to increased motivation and 3) division of responsibilities compared between frameworks and practice.

In the second section, the discussion is about whether the roles of Scrum Master and Product Owner, Product Manager and Release Train Engineer should be separate.

The third section discusses the recommended pay scales for the Scrum Master, Product Owner, Product Manager, and Release Train Engineer, as there is uncertainty about which levels to hire these roles.

In the last section, who should be responsible for delivering the results is discussed. It also discusses who should be accountable for delivering results between the Scrum Master and the Product Owner, as it may vary across organisations.

6.1 Key Findings Across the Agile Roles

This section discusses the key findings across the roles in three parts. Firstly, it will discuss the motivational characteristics across the roles and their corresponding outcomes to determine which roles have higher scores. Secondly, it will discuss distinguishing factors per role that could lead to increased motivation. Lastly, it will focus on discussing the distribution of responsibilities as outlined in literature frameworks and compare it with survey data.

6.1.1 Outcome Trends across the Roles

It is worth mentioning that the findings in Table 26 show that the employees have a clear understanding of their roles and experience less conflict related to them. They are aware of the obligations, and have a clear understanding of what is expected of them. They possess the necessary resources to carry out their duties effectively.

The Release Train Engineers scored lowest compared to all the roles. RTEs who were the least motivated had relatively less work experience. This could suggest that such employees might not yet have adjusted well to their role as compared to those who have had a longer tenure. Additionally, the data also revealed that the least motivated RTEs reported high levels of role conflict. This could be attributed to their lack of experience and understanding of their role. As it can be argued that there is still uncertainty around this role.

It is also worth noting that the findings indicate that the Product Owner and Scrum Master scored the highest on Team Performance compared to the other roles.

According to (Hoegl et al., 2001), team performance can be defined as the extent to which a team can accomplish predetermined objectives related to quality, cost, and time. Two key variables that determine team performance are effectiveness and efficiency. Effectiveness refers to the extent to which the team meets expectations with regard to the outcome's quality, such as functionality, robustness, reliability, and performance. Efficiency is measured by how well the team adheres to schedules and budgets, such as starting manufacturing and/or marketing on the target date and staying within target costs for the project and the finished product.

As per the Scrum and Scaled Agile framework guides, the Product Owner is responsible for ensuring that the work of the Scrum Team results in a maximisation of the product's value. The Product Owner's primary duty is to maximise the value delivered by an Agile team. The agile team generates value by selecting tasks from the backlog, executing user stories, combining and testing modifications, and providing an incremental solution. Thus, by prioritising items in the product backlog, the Product Owner ensures that the team's work is efficient and effective. The Product Owner validates the product against user expectations and tests its quality. Additionally, the Product

Owner, alongside the Product Manager, is responsible for communication with all stakeholders, financiers, and the team. Hence, he also takes care of the project's financial side.

Based on frameworks such as the Scrum Guide and Scaled Agile Framework, the Scrum Master also has the responsibility to ensure that the team's work is effective. Assisting the Scrum Team in concentrating on generating valuable increments that fulfil the criteria of completion is how this is accomplished. Additionally, the Scrum Master is accountable for ensuring that all Scrum events are conducted positively, productively, and within the allotted timebox. By doing so, the Scrum Master can significantly improve the team's workflow by eliminating bottlenecks, delays, and waste.

When examining the responsibility of the Product Owner and Scrum Masters towards team members' performance and comparing this to the team performance definition of Hoegle and Gemeunden, it can be argued that these two roles work most closely with the team members to maximise their performance. Therefore, it can be suggested why these two roles reported higher team performance.

6.1.2 Distinguishing Factors per Agile Role that Could Lead to Increased Motivation

This section will discuss the distinguishing factors of the agile roles that could lead to increased motivation. Internal motivation has been found to have a direct impact on work quality and predicts high work performance (Hackman & Oldham, 1974, 1975, 1978).

6.1.2.1 Scrum Master

According to the findings, team leadership was solely the highly motivated Scrum Master's task. According to the Scrum Guide (Schwaber et al., 2020) and other researchers (Sachdeva, 2016; Noll et al., 2017; Bass, 2014; Uludag et al., 2017; Gustavsson, 2018), it is the responsibility of the Scrum Master to coach team members in self-management and cross-functionality, ensure that the Scrum team is focused on developing valuable increments, and aid employees and stakeholders in understanding and executing an empirical approach for complex work. Hence, the finding is in accordance with the framework of this responsibility of the Scrum Master. Additionally, it can be argued that strong communication skills are crucial for scrum masters since they require extensive collaboration with teams and stakeholders to accomplish their tasks.

According to the findings, day-to-day work allocation was also the highly motivated Scrum Master's responsibility, as well as the team's responsibility. However, according to the frameworks and literature, teams are self-organising and plan their own work. Hence, day-to-day work allocation is solely their responsibility (Scrum Guide; Scaled Agile Framework; Remta et al., 2021; Sachdeva, 2016). Since Scrum Masters work closely with the team to ensure the delivery of high-value

increments, it could be a possible explanation as to why they are also responsible for planning the team's work in practice.

Based on the findings, different roles should handle communication with the end user. According to the frameworks and literature, the Product Owner and Product Manager manage communication with end users (Kadenic et al., 2023; Maglyas et al., 2013; Tkalich et al., 2022). Hence, the result is in alignment with the frameworks.

The findings indicated that the pay scale differences were either zero or one between the highly motivated Scrum Masters and Product Owners. Since the Product Owner and Scrum Master are team-level roles according to the frameworks, it might be a possible explanation as to why these roles were paid similar salaries.

Considering these distinguishing factors, it can be argued that to boost motivation among Scrum Masters, organisations may want to assign team leadership solely to them, share day-to-day work allocation between Scrum Master and Team, and distribute communication with end-users among several roles, as the framework indicates. Organisations could also motivate Scrum Masters by empowering personal development, such as communication skills. Additionally, organisations could consider being transparent about the salaries of Scrum Masters and Product Owners to boost their motivation. Provide clear communication regarding both role's salaries. Also, salaries depend on several factors, such as personal circumstances, work experience, certifications, work environment, etc. (Schuldes, 2006). However, it is worth mentioning that the Scrum Master might not be motivated by the pay scale alone. One could suggest that social contacts (supervisor or colleague interaction), autonomy in work or diverse responsibilities contribute to their motivation. Moreover, it could be observed that the motivational characteristics of highly motivated Scrum Masters were higher than those of the least motivated ones. Therefore, designing one's job with motivational characteristics could lead to higher motivation levels.

6.1.2.2 Product Owner

Based on the findings, facilitating rituals and upholding agile principles lay solely with the Scrum Masters while managing the team's backlog was solely the highly motivated Product Owners' responsibility. These responsibilities are in accordance with the framework guides and literature (Schwaber et al., 2020; Scaled Agile Framework Guide; Remta et al., 2021; Sachdeva, 2016; Kadenic et al., 2023). According to the Scrum Guide, the Scrum Master is responsible for organising Scrum as explained in the Scrum Guide and facilitating sprints. The Product Owner, on the other hand, is responsible for managing the team backlog.

The results also indicated that collaboration with stakeholders was also the responsibility of team members besides themselves. In contrast, the framework and literature indicated that this

responsibility is for the Product Owners, Product Managers and Release Train Engineers. As per the Scaled Agile Framework Guide, Product Management is responsible for conveying the product vision to solution-train stakeholders. Product Owners receive continuous input, feedback, and insights from customers, stakeholders, and teams. Release Train Engineers help check if the backlog aligns with strategy by collaborating with Product and Solution Management, Business Owners, Product Owners, and other stakeholders. It can be argued that if team members directly receive input from stakeholders, it could lead to better understanding and product increments, rather than solely relying on communication with the Product Owner who represents all stakeholder inputs.

Organisations could consider assigning and including these distinguishing factors to increase the motivation of Product Owners. In addition, the highly motivated product owners felt that the pay scale difference between them and the Scrum Masters was either zero or one, which could be a contributing factor to their increased motivation. When analysing the differences in motivational characteristics between the least motivated and highly motivated Product Owners, it was observed that the highly motivated ones had lower motivational characteristic scores. However, no explanation or reason to account for this pattern was found in the survey data.

6.1.2.3 Product Manager

According to the findings, delivery responsibility was solely the highly motivated Product Manager task. This responsibility is in accordance with the Scaled Agile Framework Guide and literature, which indicates that the Product Manager aligns product strategy, vision, and roadmap to portfolios. It could be argued that the Product Manager bears the responsibility for delivery, as they have access to budgets and need to know how the product brings value to the customer and what value the company requires in return.

Based on the results, management of team backlog was shared between highly motivated Product Managers and Release Train Engineers (RTE). However, according to (Scaled Agile Framework Guide; Maglyas et al., 2013; Tkalich et al., 2022), Product Management makes sure that features in the ART backlog have clear acceptance criteria. Additionally, the guide also indicates that the RTEs help check if the backlog aligns with the strategy by collaborating with product and solution management, business owners, product owners, and other stakeholders. It could be possible that Product Managers share this responsibility with RTEs because both roles work closely together to help teams deliver value.

Furthermore, the findings indicated that growing talent and managing compensation were shared between the highly motivated Product Managers and Line Managers. However, the literature indicates that Line managers are responsible for employee health, recruitment, feedback and evaluation, competence development, salaries, and work environment (Ljung et al., 2019). One possible reason

why Product Managers might influence employee compensation and recruitment decisions is that they have access to project budgets and work closely with product owners and RTEs to determine the feasibility of the teams. They could determine the appropriate compensation for a project and identify the necessary skills needed.

Organisations looking to increase the motivation of their Product Managers could incorporate these distinguishing factors into their responsibilities. The highly motivated Product Managers did not provide any information on the pay scale for Release Train Engineers. It is possible that they are not aware of this salary information or chose not to disclose it. It is important to note that salaries depend on various factors such as personal circumstances, work experience, certifications, work environment, etc. Additionally, the motivational characteristics of highly motivated Product Managers are higher than those of the least motivated Product Managers. Therefore, it can be argued that designing one's job with motivational characteristics could lead to higher levels of motivation.

6.1.2.4 Release Train Engineer (RTE)

The findings showed that continuous improvement was shared among several roles. However, according to the Scaled Agile Framework Guide and literature, a Release Train Engineer (RTE) helps drive continuous improvements. They communicate with stakeholders, manage risks, escalate obstructions, and drive continuous improvement. Since the Scrum Master and Product Manager are also responsible for communicating with stakeholders and addressing product or development-related issues, it could be argued why different roles should share this responsibility.

Similarly, managing a team backlog was shared among several roles instead of entrusting it to the Product Manager. According to the Scaled Agile Framework, the Product Manager is responsible for managing and prioritising the ART backlog, and the Release Train Engineers help to check if the backlog aligns with strategy by collaborating with Product and Solution Management, Business Owners, Product Owners, and other stakeholders. Collaboration and feedback from different roles (internal stakeholders) might be necessary to manage and prioritise the product backlog in such a way that the ART continuously delivers value. Therefore, it may be necessary to have multiple roles responsible for the product backlog instead of entrusting it only to the Product Manager.

Additionally, collaboration with stakeholders was shared among several roles, which is in accordance with the Scaled Agile Framework Guide, as collaboration with stakeholders is done by the Product Owner, Product Manager, and Release Train Engineer. Since agile is people-centric and about collaboration and communication, it can be argued that all the roles require collaboration with one another or stakeholders to deliver value.

Perhaps sharing the responsibility of continuous improvement with other roles might increase the Release Train Engineers' motivation level. The data showed that the RTEs who were the least

motivated had relatively less work experience. This could suggest that such employees might not yet have adjusted well to their role as compared to those who have had a longer tenure. Additionally, the results also revealed that the least motivated RTEs reported high levels of role conflict. This could be attributed to their lack of experience and understanding of their role. However, organisations could address role conflict by promoting clear communication among employees, encouraging them to share perspectives, explore options together, and define the next steps. By comparing the motivational characteristics scores of the least motivated RTEs with the highest motivated RTEs, it can be inferred that the highly motivated ones scored relatively higher. Therefore, it can be argued that designing one's job with Motivational Characteristics could lead to higher levels of motivation.

6.1.2.5 Line Manager

Based on the findings, different roles were responsible for day-to-day work allocation. The literature and Frameworks indicate that the development team plans its work as it is self-organising. Since Product Owners and Scrum Masters work closely with the team, and the Product Manager and Release Train Engineer work closely with the ART, it is possible that they are helping the team plan its work for optimal feature delivery.

Additionally, the responsibility for creating and owning the product vision and leading through product vision and purpose was shared between highly motivated Line Managers and Product Managers. However, according to the Scaled Agile Framework and literature, the Product Manager is responsible for strategy and vision definition and roadmap planning in collaboration with Product Owners (Maglyas et al., 2013; Tkalich et al., 2022). In Agile methodology, the role of managers shifts towards a more lean approach where they take on multiple responsibilities. According to the SAFe Guide, one of these responsibilities is to help align teams with the mission and vision of the system. This could explain why managers share this responsibility with Product Managers.

Organisations could utilise these findings to enhance the motivation level of their Line Manager employees by integrating them into their task assignments. It was also observed that the Line Managers who were the least motivated reported higher salaries than the RTEs and Product Managers. On the other hand, the highly motivated Line Managers indicated zero or higher salaries than both of these roles. A possible explanation could be that Line Managers might not be motivated by the pay scale alone but also by the nature of their work, scope of responsibility, or social factors. Additionally, it could be observed that three of the motivational characteristics of the highly motivated Line Managers were lower in comparison to those of the least motivated Line Managers. One characteristic was equal to the least motivated ones, while the other was higher. However, no explanation or reason to account for this pattern was found in the survey data.

6.1.3 Division of Responsibilities Compared between Frameworks and Practise

This section will discuss this study's findings on responsibilities division and compare them to the Scrum and Scaled Agile Framework Guides to identify similarities and differences.

6.1.3.1 Division of Responsibilities across Scrum Master, Product Owner and Team Members

According to the literature and Scrum guide, the Scrum framework consists of three coequal team-level roles, which are the Product Owner, the Scrum Master, and the Development Team (Schwaber et al., 2020; Sachdeva, 2016). Each role has specific responsibilities.

The findings in Table 10 indicate that the **Scrum Master's** responsibilities mostly align with the Frameworks strengthening the Framework Guides definition of this role.

According to the results, the Scrum Master was responsible for team leadership, facilitating rituals, upholding agile principles, promoting transparency, continuous improvement, and evaluating performance.

According to the Scrum (Schwaber et al., 2020) and Scaled Agile Framework (Leffingwell, 2024) Guide, the Scrum Master is responsible for establishing and enforcing Scrum practices as defined in the Scrum Guide. It is their duty to ensure that all Scrum events take place smoothly and are positive and productive. By identifying and eliminating bottlenecks, delays, and waste, the Scrum Master can significantly improve the team's workflow. They are open to feedback and value transparency from others. They also help the team set up metrics to evaluate and improve its overall performance.

However, according to the results, some job responsibilities were shared by other roles but in smaller sample sizes than the Scrum Master role. For instance, transparency was also a team's task, and Product Owners also undertook performance evaluations.

As per the Scaled Agile Framework Guide, the Scrum Master plays a crucial role in helping the team provide transparency. This is done by inspecting the artefacts, recognising any significant differences between expected and actual outcomes, and identifying anti-patterns. The Scrum Master also assists the team in setting up their digital or physical planning areas and ensures that visual radiators are in place to promote transparency and collaboration. This could be a possible explanation as to why the team is also responsible for being transparent. Since they are the ones that deliver the actual feature, it might be crucial for them to see how they are performing and improve accordingly.

The Scrum Guide does not mention about Product Owners evaluating the performance of the team. However, since the Product Owner works closely with the team to ensure their work is effective and efficient, it can be argued that they also evaluate how the team is performing.

Based on the findings, the **Product Owner's** allocation of responsibilities also mostly aligns with the Frameworks strengthening the Framework Guides definition of this role.

According to the results, the Product Owner was responsible for delivering the product vision, delivering the project on time and budget, managing the team's backlog, collaborating with team members and stakeholders, and communicating with end-users.

According to the Scaled Agile Framework Guide, the Product Owner contributes to the vision and roadmaps that guide solution implementation by better understanding the solutions and experiences that the ART (Agile Release Train) can deliver. Product managers focus on examining the solutions and experiences that an ART should deliver. The ART Backlog is checked by them to ensure that it aligns with the vision and roadmap.

The shortest sustainable lead time and the correct sequence are necessary to deliver the highest-value backlog items and achieve continuous value flow. The responsibility of ordering backlog items on a regular basis, based on their cost of delay and communicating this order to the team, falls on the PO. It is also the PO's responsibility to ensure that the project is completed on time and within the budget.

The Product Owner is also responsible for managing and prioritising the team's backlog. Additionally, they constantly collaborate with end-users, customers, stakeholders, and teams to receive input, feedback, and insights that can impact solution development.

However, some job responsibilities were also shared by other roles but in smaller sample sizes than the Product Owner role. For example, the team was also responsible for delivery and staffing decisions were made by the product owner and another designated role.

According to the Scaled Agile Framework Guide, the Product owner supports the team in delivering value by prioritising the team backlog. At the same time, the team actually delivers the value by defining, building, and testing their stories. This could be a possible explanation as to why the team is also considered responsible for the delivery.

The framework guides do not specify if the Product Owner is responsible for staffing. However, the Product Owner prioritises the team backlog based on the team's skills, knowledge, and availability. This might allow the Product Owner to have a clear understanding of the required skill sets and knowledge needed from each team member to ensure a successful product increment. Hence, they might share staffing responsibilities.

The results showed that **team members** were responsible for allocating daily work, being transparent, and developing solutions.

The responsibilities mentioned align with the Scrum and Scaled Agile Framework Guides, as the team members are self-organising; they plan their work. The Scrum Masters help the team to be transparent by assisting the team in setting up their digital or physical planning areas and ensuring that visual radiators are in place to promote transparency and collaboration. Additionally, the team delivers value by defining, building, and testing their stories. It seems that the team members' tasks remained untouched.

It can be argued that the cooperation between the Scrum Master and Product Owner is crucial, as it impacts the development team. If there is inadequate collaboration between these two roles, it could have negative consequences on implementing agile methods and the overall agile transformation process. One could propose that effective networking skills and a well-established internal network are crucial for the Product Owner and Scrum Master roles in a team to facilitate meaningful collaborations. Additionally, establishing and managing a network and relationships might heavily rely on communication skills. Assuming then that both roles also require good communication skills. The results strengthen the Scrum Guide; however, looking at the shared responsibilities as indicated by the data, it could be that organisations customise the Scrum Master and Product Owner roles according to their organisational environment to fit their unique organisational context and the team's needs.

6.1.3.2 Division of Responsibilities across Release Train Engineer, Product Manager and Line Manager

According to the Scaled Agile Framework guide (Leffingwell, 2024), the Release Train Engineer (RTE) and Product Manager (PM) are co-equal program-level roles, each with specific responsibilities.

The study’s findings indicated that the Release Train Engineer was responsible for leadership, facilitating rituals, guarding agile principles, and continuous improvement.

The responsibilities mentioned align with the Scaled Agile Framework, as the RTE is a leader who serves the team and acts as an ART (Agile Release Train) coach. Their responsibility involves facilitating ART events and processes and supporting teams in delivering value. RTEs frequently take part in the Lean-Agile transformation by providing coaching to leaders, teams, and Scrum Master/Team Coaches on new processes and mindsets. They also help to adapt SAFe (Scaled Agile Framework) to the organisation's requirements by standardising and documenting practices. Furthermore, they facilitate PI (Program Increment) planning, communicate with stakeholders, escalate impediments, help manage risk, and drive continuous improvement.

It is worth noting that some job responsibilities were shared by other roles but in smaller sample sizes than the Release Train Engineer. For example, the responsibility of leadership was shared with the Line Manager. According to the SAFe Guide, Line Managers are responsible for developing individual capabilities and also serve as agile coaches and advisors to agile teams. This could explain why respondents suggested sharing leadership with Line Managers.

Additionally, other roles shared the facilitation of rituals and guarding agile principles. As per the Scrum Framework, RTEs are regarded as the Chief Scrum Masters. They are responsible for facilitating rituals and agile principles at the program level. However, respondents may have indicated that this responsibility is shared with the Scrum Master since the latter facilitates rituals and agile principles at the team level.

Both the Product Manager and Line Manager shared continuous improvement. The Scaled Agile Framework Guide indicates that Product Management frequently collaborates with System Architects and the Release Train Engineer to ensure the successful delivery of ART and team. This could be why respondents indicated that continuous improvement should be shared with Product Managers. Additionally, Line managers are responsible for providing guidance and support for career and personal development, evaluating performance and offering corrective actions, and gathering team input, which could explain why respondents suggested that continuous improvement be shared with them.

The results indicated that the **Product Manager/CPO** was responsible for various aspects of product development. These included maintaining transparency throughout the product development process, effective planning, ensuring timely delivery of projects within the allocated budget, delivering the product vision, leading the team with a clear product vision and purpose, managing the product backlog, collaborating effectively with both the team and stakeholders, maximising product value, and having a good understanding of the business.

Some of the responsibilities were also shared by other roles but in smaller sample sizes than the Product Manager. For example, transparency was also the responsibility of the release train engineer, and collaborating with the team was also the responsibility of Line Managers.

The Product Manager's responsibilities in the study findings are mostly in alignment with the Scaled Agile Framework Guide.

The full description of transparency in the survey is as follows: "*Ability to provide insight to stakeholders on the product and market. Ability to inform stakeholders of the current status of development work. I use various tools and other information radiators to visualise progress-relevant metrics and ensure a smooth flow of value.*"

The Scaled Agile Framework Guide states that Product Management should continuously explore market dynamics and user preferences, refine and communicate the product vision to the ART (Agile Release Train), and support the flow of work through the ART Backlog to deliver value. Based on survey data, most respondents believe that transparency is primarily the responsibility of the Product Manager. However, a smaller group of individuals indicated that the responsibility also falls on RTEs. This may be because the survey included a question about visualising progress-relevant metrics. According to the framework, to ensure a smooth flow of value, RTEs utilise a range of tools and information radiators.

Effective planning is the responsibility of the Product Manager and the RTEs, as outlined in the Framework. The RTEs are responsible for establishing and communicating the annual calendars for Iterations and PIs, scheduling any pre-planning activities, escalating impediments and managing risks. Meanwhile, the Product Manager plays a significant role in various activities such as PI Planning, inspection and adaptation of activities, biweekly System Demos, Solution Demos, and PI System Demos. They actively impart knowledge, collect feedback, and address product-related issues. They have the opportunity to take part as Business Owners, which involves approving PI Objectives, evaluating business value, and handling risks.

According to the Framework, the product manager is responsible for delivery. Product Management aligns product strategy, vision, and roadmap with the portfolio's Strategic Themes, Portfolio Vision, Lean Budgets, Guardrails, and Solution Vision.

According to the Framework, the Product Manager (PM) is responsible for defining the product strategy, vision and roadmaps, delivering value and managing and prioritising the ART backlog. The PM collaborates with stakeholders, teams, and customers to deliver value and maintain in-market solutions. The Product Manager must thoroughly understand the business because they provide business context to the Product Owner, ensure that solutions deliver tangible business value, and align strategy with business objectives. Additionally, Line Managers play a crucial role in supporting self-organisation, which leads to team formation. Teams rely on them to resolve problems that cannot be solved internally and to make necessary personnel adjustments. Line managers are responsible for assessing performance, which includes evaluating input from their team, and offering guidance and corrective actions. Additionally, they act as an Agile coach and advisor to the Agile Teams they oversee. Line managers should strike a balance between being hands-on enough to provide value and being competent managers while also giving their team enough space to solve problems on their own.

According to the results, the **Line Manager** was responsible for recruiting, developing and retaining capable individuals, evaluating performance, and managing compensation, benefits, and promotions.

According to the literature and Scaled Agile Framework Guide, apart from the traditional tasks such as developing individual capabilities, recruiting and retaining individuals, and managing compensation, benefits, and promotions, they also get new responsibilities and value-added activities. Such as personnel and team development, support and reinforce SAFe core values, responsibilities in alignment, transparency, respect for people and relentless improvement.

In Scaled Agile, managers no longer have to focus on controlling work, so they can instead concentrate on hiring and nurturing the best talent for their teams. They plan for necessary training and pairing activities to enhance the workforce's skills. They can also spend more time on individual coaching and mentoring. Additionally, they can acquire new skills to become lean-thinking manager-teachers. This way, they can demonstrate Lean-Agile leadership's values, mindset, and principles.

It appears that the Line Managers' administrative tasks have remained mostly unchanged. These tasks include employee health, recruitment, feedback and evaluation, competence development, salaries, and work environment, which are similar to those mentioned in traditional management theory. Despite the changes brought by Scaled Agile, employees still require assistance with career development. Therefore, managers must continue to set and manage expectations, provide compensation, and offer coaching to enhance individual skills and career goals. According to the Framework, managers are ultimately responsible for growing the skills and abilities of their staff.

Performance evaluation is also the task of the Release Train Engineers (RTEs). They help monitor and track the progress of Features in the ART Kanban and ensure that the ART meets its definition of done. They also manage the removal of impediments and escalate and resolve issues that the teams cannot handle independently.

It can be argued that the cooperation between the agile roles is crucial, as it impacts the development team. If there is inadequate collaboration between these roles, it could have negative consequences on implementing agile methods and the overall agile transformation process. It might also be suggested that the roles of Product Manager, Release Train Engineer and Line Manager in a team require strong networking abilities and a well-established internal network to ensure fruitful collaborations. Additionally, the ability to establish and manage a network and relationships might be heavily reliant on communication skills. Assuming that these roles require good communication skills. As some of the responsibilities are shared, as indicated by the results, it could be that organisations customise the definition of these roles according to their organisational environment to fit their unique organisational context and the needs of the team.

6.2 Should the Roles of Scrum Master and Product Owner, Product Manager and Release Train Engineer be Separated

Scrum Master and Product Owner roles are relatively new terms in project management frameworks. The implications of recruiting for these roles, their definitions, and aspects such as empowerment and authority are not fully understood (Gustavsson, 2017; Uludag et al., 2018; Remta et al., 2021; Kadenic et al., 2023). Since Scrum is the most commonly used methodology in this research, organisations struggle to implement the Scrum Master and Product Owner roles. Therefore, these roles will be discussed more extensively.

6.2.1 Should the Roles of Scrum Master and Product Owner be Separated

A Scrum team consist of three different roles: the Product Owner (PO), the Scrum Master (SM), and the Team Member (Schwaber, 2004; Sverrisdottir et al., 2014; Schwaber et al., 2020). All members of a Scrum team play different roles in managing and supervising projects. Each role is essential for efficient Scrum processes. Scrum teams contain individuals with diverse professional backgrounds. Each team possesses all the necessary knowledge required to execute the project, and therefore, the team does not need to rely on external input for the work (Schwaber, 2004). According to Sverrisdottir et al. (2014), the Scrum Master and Product Owner roles perfectly complement each other. "What" to do is the responsibility of the PO while "how" to do it is the responsibility of the SM (Sverrisdottir et al., 2014).

Based on the framework guides and results, it can be argued that the two roles should be separated for at least three reasons. Firstly, combining the responsibilities of both roles may be too much for one person to handle due to their diverse responsibilities. Secondly, both roles have different risk profiles, which align with their different responsibilities. Nathan S. Collier wrote a column stating that when people are given a job with conflicting tasks, they tend to focus on what is easier and more controllable for them rather than what is most vital. Finally, both roles have different goals to achieve. These goals may interfere with one another, especially when trying to achieve them simultaneously. According to Worren and Pope's framework (2021), in situations where there is functional conflict (goal conflict), the best approach is to separate the roles rather than integrate them. This means achieving the required degree of coordination without placing the roles in the same sub-unit, such as a team or department.

6.2.1.1 Too Many Responsibilities for One Person

The Product Owner role is a crucial and challenging one in the Scrum methodology (Schwaber, 2004; Sverrisdottir et al., 2014). This is because the success of a project relies on multiple factors such as organisational culture, project type, management approach, and team interaction. The Product Owner is responsible for ensuring the project's success, providing guidance and support to all team members involved in the development process, and making tough decisions when required. It is typically a full-time role. According to Kadenic et al. (2023), the Product Owner role requires a range of activities, tasks, and responsibilities that a single individual cannot fulfil, which is a significant concern. To be an effective Product Owner, one needs to have a high level of skill and understanding of the role's nuances (Kristinsdottir, 2014). Additionally, the organisation must support the Product Owner by providing enough time to engage the teams fully and deliver value-based outcomes. Based on research, the Product Owner (PO) is responsible for multiple tasks and, therefore, requires specific characteristics (Unger-Windeler et al., 2019). Researchers and the framework generally agree that the PO should be an individual, not a committee (Sverrisdottir et al., 2014; Unger-Windeler et al., 2019; Schwaber et al., 2020).

The Scrum Master is also a critical role in the Agile/Scrum framework (Ereiz, 2019; Schwaber et al., 2020). They act as the primary point of contact for all Agile/Scrum-related queries and take on a lot of behind-the-scenes work, which helps the team to be more productive and focused on their tasks. It should be emphasized that the absence of a Scrum Master in a Scrum project increases the likelihood of failure. Additionally, without a Scrum Master, the project cannot be considered an actual Scrum project. The Scrum Guide explicitly states that a Scrum Master is mandatory, and good reasons exist for this requirement.

Based on the results and framework, the roles of Product Owner and Scrum Master are diverse and have many responsibilities. If these roles are combined, it can be difficult and uncontrollable for a single person to manage them effectively. This could lead to role ambiguity, where the employee is unclear about their responsibilities, how to allocate their time, or what their goals and objectives are. In literature, role ambiguity has been linked to negative effects on employee well-being, such as burnout, stress, and overload (Morgeson et al., 2008; Lang et al., 2007). Burnout has negative consequences not only on an individual's health, safety, and well-being but also on their productivity, quality of service, and cost-effectiveness for the organisation (Sinval et al., 2019). Job burnout and overload have been known to lead to reduced job satisfaction and organisational commitment and can result in unwanted behaviours such as personnel turnover and absenteeism (Bakker et al., 2004). Both roles are necessary for a successful Scrum process. If the Product Owner role includes tasks that may be difficult for one person to accomplish alone, combining it with Scrum Master activities is unlikely to result in successful product development. Therefore, it can be argued to keep the two roles separate.

Being a Product Owner or Scrum Master requires full-time attention and effort (Schwaber et al., 2020; Sverrisdottir et al., 2014). If an organisation tries to merge the responsibilities of both roles into one, it could lead to unfavourable outcomes. Combining the responsibilities of roles with different professional backgrounds might result in only focusing on their strongest skills and neglecting other responsibilities, leading to poor outcomes.

Therefore, it is not recommended for a Product Owner to act as a Scrum Master or vice versa. If a Scrum Master takes on the role of a Product Owner, they may not have access to customers to gather feedback. Without valuable and actionable feedback, the team may end up delivering the wrong product. It is possible for a Scrum Master to unintentionally sabotage a team's productivity by acting as the Product Owner without a clear vision for the project. This can happen when the Scrum Master does not have direct access to customers or lacks a clear understanding of the product's goals, resulting in a backlog that prioritises tasks that interest them or that they are familiar with. The team may then end up focusing on minor bug fixes or enhancements to existing features without making any significant progress towards achieving the project's goals. It is important to note that this does not necessarily mean that the work being produced is of low quality; instead, it may not contribute meaningfully to the project's overall success.

If the Product Owner takes the role of Scrum Master, it can be suggested that retrospective meetings might suffer, as their outcomes may appear less important to a busy Product Owner. These meetings might seem unimportant to the organisation and eventually die out. Alternatively, regular meetings might still occur, but their focus might subtly change. For instance, daily standups might still occur, but instead of being an opportunity for the team to plan their work for the day, they might turn into status meetings where each team member updates the Product Owner on their progress. Similarly, sprint planning meetings might still take place, but instead of the team collaborating to arrive at estimates and a sprint plan, they may feel pressured by an overly enthusiastic Product Owner to make uncomfortable commitments.

6.2.1.2 Different Risk Profiles for Both Roles

Different outcomes of employee job performance can have varying impacts on firms (Baron et al., 1999, pp. 26-29). When a good performance can greatly benefit the company, while a bad performance is not too bad, it is called a star job. Jobs that require the production of knowledge or innovation, where only the best ideas are adopted after careful evaluation, are typically considered star jobs. When a bad performance can lead to a disaster, but a good performance is only slightly better for the firm than an average performance, it is referred to as a guardian job. Guardian jobs are frequently present in technological work that involves a complicated and interrelated production system, where the overall performance is heavily reliant on the weakest individual contribution. A specific example of this involves workers representing the organisation to a key external clients where

the organisation's reputation is valuable. In this case, if there is a single screw-up, the organisation will suffer disproportionately as word of it will be spread among the external constituency. For instance, in a company that values innovation, a researcher who comes up with a groundbreaking idea is highly valued. However, when deciding which innovation to invest in or implement throughout the company, the manager's decision can have significant positive or negative consequences for the organisation.

Workers whose jobs involve a combination of star-guardian patterns are typically hard to manage (Baron et al., 1999, pp. 26-29). This is because, to prevent disasters, failure must be dealt with severely, and much attention must be paid to the selection and training process. However, to achieve star performance, risk-taking must be encouraged, and the organisation must be open to testing many candidates for the position to find the one with the potential to be a star. The twin goals of minimising disasters and promoting risk-taking to achieve outstanding results are hard to balance. In this kind of job, disaster prevention is often prioritised over encouraging risk-taking. One reason for this is that losses tend to have a bigger impact than gains do. It is best to avoid the combined star-guardian pattern if possible because of the inherent contradiction in motivating and selecting a single job's star and guardian aspects.

As a Product Owner, one crucial task is prioritising the product backlog to ensure the development team can complete the work in the upcoming sprint (Schwaber et al., 2020). This is important as it allows the team to deliver the right feature at the right time. Even if a feature delivered in a sprint is not the correct one, it might not have a significant impact on the end project as it can be replaced or improved in the next sprint. Relating the Product Owner role to a star job.

The primary responsibility of a Scrum Master is to teach consistently, coach, mentor the team, and remove any obstacles that may hinder the team's progress (Schwaber et al., 2020). If the Scrum Master fails to remove hurdles or coach team members effectively, it might directly impact the project by delivering a less valuable product. It may also hinder the team's progress towards achieving their goals. Relating the Scrum Master role to a guardian job.

The Scrum Master's role involves consistently minimizing risk by delivering incrementally, responding quickly to development obstacles, and continuously monitoring the delivery of increments. On the other hand, the Product Owner plays a crucial role in reducing significant project risks by prioritizing the Product Backlog (Tavares et al., 2016). As per Baron et al. (1999), it could be argued that the organisation may incentivise the Product Owner to take risks, while the Scrum Master may be tasked with preventing disasters. Because of this contradiction in motivating, combining these roles could be challenging, as it is best to avoid the combined star-guardian pattern.

Additionally, a column written by Nathan S. Collier stated that when given a job with conflicting tasks, people tend to focus on what is easier and more controllable for them instead of what is most

vital. They tend to stick to their comfort zone. A good manager or leader should strive to balance challenging the comfort zones of their employees while ensuring that the challenges of the job, the skill set, and the personality of the team members are reasonably aligned.

Considering the different task and risk profiles of both roles, it can be argued that they should be separate.

6.2.1.3 Functional Conflict (goal conflict)

Warren and Pope (2021) suggested a framework of design rules for organisations struggling to implement new concepts such as DevOps or agile methodologies, especially when it requires structural changes and integration of roles (Worren et al., 2021). This framework takes into consideration the degree of functional conflict (i.e., goal conflict) and work-process interdependency (i.e., task interdependency) between the roles in question, where the appropriate degree of integration or separation depends on both factors. For example, when there is high functional conflict (disagreements between team members) and low task interdependency (tasks do not heavily depend on one another), it is recommended to separate their roles, see Figure 18. This way, they can coordinate their work without working closely together (i.e., without being in the same team or department).

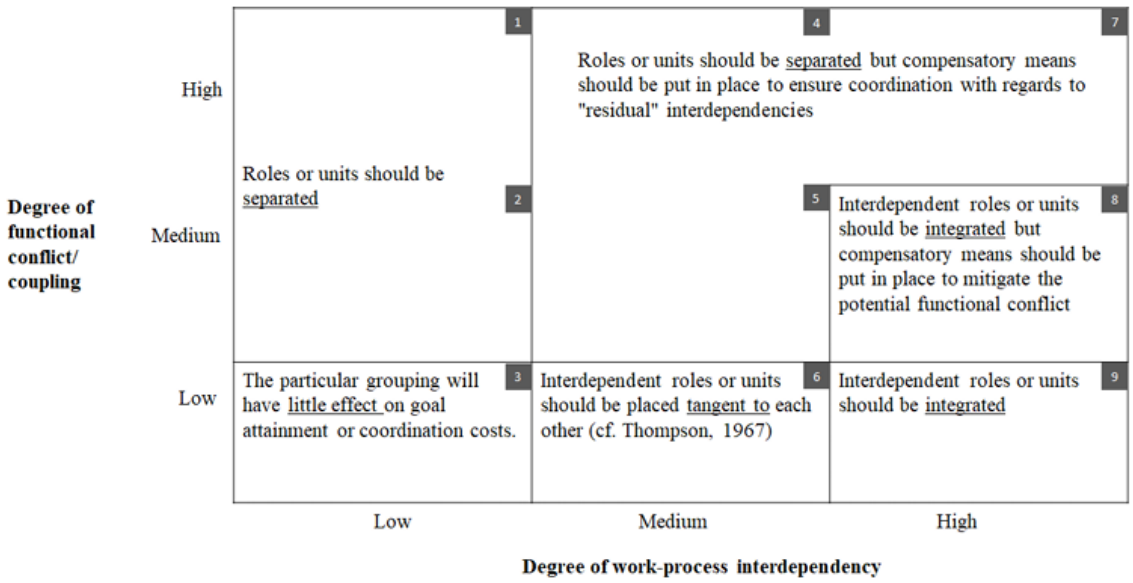


Figure 16 Suggested design rules for situations with varying degrees of functional conflict (i.e., goal conflict) and work-process (or task) Interdependency (Worren et al., 2021)

Comparing the study's results (Figure 14) with Worren's model, it can be argued that the results fall in a somewhat grey area. Although the framework stipulates that roles should be separated, there is limited research on the reasons behind this requirement.

6.2.2 Should the Roles of the Product Manager and Release Train Engineer be Separated

The SAFe Guide identifies three co-equal roles on the program level: Product Manager (PM), Release Train Engineer (RTE), and System Architect. The Product Manager is responsible for determining what needs to be done, and the Release Train Engineer oversees the implementation and operation of servant leadership.

The RTE role is centred around facilitating the implementation of SAFe principles. They coach teams to take ownership of planning and tracking instead of doing it for them. On the other hand, the Product Manager role is primarily concerned with business objectives. They oversee the software development lifecycle to ensure software capabilities align with the business objectives.

The results strengthen the SAFe Guides' definitions of these two roles.

According to the literature, a product manager is portrayed as an expert, strategist, leader, or problem solver who makes all the decisions (Maglyas et al., 2013). Additionally, a product manager's role varies depending on the company's size, business, and domain. Therefore, a product manager may be required to wear many hats. The tasks of a product manager can differ significantly depending on the company. When there are many activities, it is unrealistic for one person to handle them alone. This means that responsibilities are shared among different people.

The roles of PM and RTE are diverse and have many responsibilities. Combining these roles might lead to difficulties and become uncontrollable for a single person to manage them effectively. This could lead to role ambiguity, where the employee is unsure about their responsibilities, how to allocate their time, or what their goals and objectives are. Role ambiguity has been linked to negative effects on employee well-being, such as burnout, stress, and overload (Morgeson et al., 2008; Lang et al., 2007). Burnout has negative consequences not only on an individual's health, safety, and well-being but also on their productivity, quality of service, and cost-effectiveness for the organisation (Sinval et al., 2019). Job burnout and overload have been known to lead to reduced job satisfaction and organisational commitment and can result in unwanted behaviours such as personnel turnover and absenteeism (Bakker et al., 2004). If the PM role includes tasks that may be difficult for one person to accomplish alone, combining it with RTE activities is unlikely to result in successful product development. Therefore, it can be suggested that the two roles be kept separate.

Both roles, PM and RTE, have distinct goals to achieve. The PM focuses on delivering value to the customers and the business. In contrast, the RTE focuses on facilitating ART (Agile Release Train) events and processes and safeguarding SAFe (Scaled Agile Framework) principles. In situations where there is functional conflict (goal conflict), according to Worren and Pope's framework (2021), the best approach is to separate the roles rather than integrate them. As explained by Nathan S.

Collier, when people are given a job with conflicting tasks, they tend to focus on what is easier and more controllable for them rather than what is most vital.

If an RTE takes on the role of a Product Manager, they may not have access to customers and market trends. The team may deliver the wrong product without valuable and actionable market dynamics and customer preferences. Without the right knowledge, skills and clear project vision, the RTE might unintentionally sabotage the team's productivity.

If the Product Manager takes the role of the RTE, it can be suggested that Product Increment (PI) meetings might suffer, as their outcomes may appear less important to a busy Product Manager. For instance, PI meetings might still occur. However, instead of being an opportunity to address risks, hurdles, and pre-planning activities, they might turn into status meetings where each team member updates the Product Manager on their progress.

6.3 Recommendations for Pay Scales: Should there be a Difference in Pay Scale between SM and PO, PM and RTE?

According to the literature, how much an employee is paid is important as money incentivises performance. Therefore, setting pay levels and linking them to performance encourages employees to improve (Sturman, 2006). Managers should closely consider the factors that motivate employees, such as pay, to enhance employee productivity, job satisfaction, and their positive contributions to the organisation (Lawler, 2003, 2005; Schuldes, 2006).

When individuals evaluate what they should be paid, they take into account several factors, such as their education, experience, skills, training, effort, age, seniority, loyalty, and past and present performance (Lawler, 1971; Mamman, 1990; Milkovich et al., 2005). They believe their strongest factors should weigh more in determining their pay (Lawler, 1966, 2003). Skill-based pay (compensation based on the number of skills) can be employed in organisations where the workforce is knowledgeable and flexible, and employees are capable of performing multiple tasks and willing to do so.

As organisations struggle with deciding at which level to hire these agile roles, this section discusses the pay scales implemented in practice and how they might impact satisfaction and motivation.

6.3.1 Pay Scale for Product Owner and Scrum Master

The **Product Owner** and the **Scrum Master** belong to the team level of Scaled Agile practices, as indicated by Scrum Framework (Schwaber et al., 2020) and Scaled Agile Framework Guide (Leffingwell). According to the frameworks and other researchers, both roles are equally responsible for adding value to the team and product development process. Both roles have a diverse set of

knowledge and professional backgrounds. Looking at the frameworks and literature, both roles should have the same income level because there is no hierarchy between the roles.

According to the results, there is little to no income difference between the roles. However, the Product Owner's salary was indicated to be slightly higher than that of the Scrum Master. Based on the data, Product Owners were more satisfied and motivated when the pay scale difference between them and the Scrum Masters was one. On the other hand, Scrum Masters were found to be more satisfied and motivated when the pay difference was zero.

The salary of a Scrum Master or a Product Owner depends on various factors as indicated by the literature (Lawler, 1971; Mamman, 1990; Milkovich et al., 2005), such as their personal situation, work experience, certifications, work environment, etc. It is possible for an experienced Scrum Master to earn a salary equivalent to that of an experienced Product Owner. The amount of responsibility, skills, and education held by an individual within the organisation are the most significant factors in determining their salary.

Because the Product Owner is responsible for deciding when and if to release the increments, setting up the backlog correctly based on stakeholders' feedback and requests, and ensuring that the product provides value to the stakeholders, it can be assumed that they own the product and have greater responsibilities compared to the Scrum Master's role and that is why they deserve the slightly higher salary.

On the other hand, if the Product Owner's salary is higher than that of the Scrum Master, then a hierarchy imbalance may exist between the roles. This may lead to employees aspiring to become only Product Owners, or the Product Owner may begin to feel superior to the Scrum Master and the team.

6.3.2 Pay Scale for Product Manager and Release Train Engineer

According to the Scaled Agile Framework Guide, the **Product Manager** and **Release Train Engineer** are part of the program-level Agile practices. Both roles are equally responsible for contributing to the team and product development process, as stated by the framework and other researchers. Based on the framework and literature, it can be inferred that both roles should receive equal compensation, as there is no hierarchy between them.

According to the results, there was little to no pay difference between the roles. Based on the data, it was found that the Product Managers who had no difference in pay scale as compared to the Release Train Engineers were more satisfied and motivated. On the other hand, the Release Train Engineers who reported a pay difference of one between them and the Product Managers were more satisfied and motivated. It is worth noting that the salaries of the product managers were reported to be higher.

As per the tasks assigned, it may seem that the role of a product manager is more diverse, complex and demanding than that of a release train engineer, and therefore, the former deserves a higher salary. However, it is essential to note that several factors determine one's salary, such as personal circumstances, work experience, certifications, skills, work environment, etc (Lawler, 1971; Mamman, 1990; Milkovich et al., 2005). The amount of responsibility, skills, and education held by an individual in the organisation is the most significant factor in deciding the salary.
Additionally, if the salary of the Product Manager is higher than that of the Release Train Engineer, it could imply a hierarchy imbalance between the roles. This, in turn, may cause the Product Manager to develop a sense of superiority over the Release Train Engineer and the team.

Additionally, the literature outlines that skill-based pay is mostly to attract and retain talented employees with unique and valuable skills. Skill-based pay can be employed in organisations where the workforce is knowledgeable and flexible, and employees are capable of performing multiple tasks and willing to do so (Lawler, 1971; Mamman, 1990; Milkovich et al., 2005). It would be recommended to compensate these roles according to their diverse skill set and performance output.

6.4 Who Should be Responsible for the Delivery of the Results of a Team Sprint/Iteration

An Agile Team refers to a team of individuals who have all the skills required to define, build, test, and deliver value to their customers, according to both the Scrum Guide and Scaled Agile Framework. These teams can either be technical teams, which are primarily focused on building digitally-enabled solutions, or business teams, which are responsible for delivering business functions. In some cases, they may even be a combination of both. Hence, agile teams have the responsibility to deliver outcomes that fulfil the requirements and satisfy the demands of their clients and stakeholders. They achieve this through self-organization and self-management.

The results led to the belief that the team was responsible for delivering results. This means that they are responsible for delivering functional software during each sprint. Both frameworks and this study’s findings support this conclusion.

The Product Owner is responsible for directing the team and ensuring they deliver value during each sprint (Scrum Guide and Scaled Agile Framework). This makes the product owner accountable for the results of each sprint.

This study’s findings agree with the literature, as the Product Owner is expected to collaborate with the team, and the team is expected to develop solutions.

In Agile development, the team holds the responsibility of delivering the final product. While the Product Owner's job is to ensure that the team is working on the right tasks, it is ultimately the team's

responsibility to actually deliver those things because they are the experts who have the skills and knowledge. Therefore, the delivery ownership of the end solution lies with the development team.

6.4.1 Who Should be Responsible for the Accountability of the Results of a Team Sprint/Iteration

According to the Frameworks, the Product Owner (PO) is responsible for ensuring that the team delivers maximum value to the customers and stakeholders. The PO achieves this by aligning the team backlog with the needs of the customers and stakeholders. Being an essential member of the team and the main customer representative, the PO provides regular insights that help the team develop high-value outputs while meeting their iteration goals.

However, there may be a difference in accountability of the results between the Product Owner and Scrum Master in organisations. It is possible that different organisations may have different practices in this regard.

According to the study's findings (Table 19), the Product Owner should be accountable for the delivery responsibility (i.e. results of sprint). In comparison, some believed this responsibility should be assigned to the Scrum Master.

The average team performance and internal work motivation were calculated for two groups of respondents: those who identified the Scrum Master as the owner of delivery responsibility and those who identified the Product Owner as the owner of delivery responsibility. The results showed that the respondents who identified the Product Owner as the owner of delivery responsibility had slightly higher team performance. Therefore, organisations may benefit from placing this responsibility on the Product Owner for better team collaboration.

6.5 Limitations

It is worth noting that this study has some limitations. The sample size is relatively small compared to similar research conducted by Hackman in 1974 and Morgeson in 2006. Only 102 IT practitioners working with agile methodologies completed the survey of the 210 respondents, which may limit the generalizability of the findings to the study's target group.

Not many respondents answered the questions about the responsibilities and pay scale of Product Manager and Release Train Engineer roles, indicating that many people are unfamiliar with how these roles function. Therefore, drawing conclusions for these roles is limited.

The responses received were unevenly distributed among the various roles, with Scrum Masters, Line Managers, Product Owners, and Team Members forming the largest group, while the smaller group consisted of Product Managers, Release Train Engineers, and System Architects. Therefore, drawing conclusions based on the responses of the smaller group may not be equivalent to the larger group.

The study's findings were derived exclusively from survey responses and did not incorporate other research methods such as interviews or examination of company records.

7 Conclusion and Future Research

This study aimed to investigate how agile roles are implemented in practice and how it influences their personal and work outcomes in organisations that adopt scaled agile. In order to achieve this, a conceptual model was developed to evaluate the responsibilities of roles, job satisfaction, internal work motivation, role conflict and ambiguity, and team performance. This model was created by reviewing the literature, drawing on sources such as Oldham and Hackman (1974, 1978), Humphrey and Morgeson (2007), and Hoegl and Gemeunden (2001), as well as consulting with professionals.

A quantitative survey was created for data collection. The research question that guided this survey was: *"How are the Scrum Master, Product Owner, Product Manager, Release Train Engineer, and Line Manager roles implemented in practice, and how does it impact their personal and work behaviour?"*

To help answer the research question, some guiding questions were created:

- Should the Scrum Master and Product Owner, Product Manager and Release Train Engineer roles be separated?
- What are the pay scale recommendations for these roles?
- Who should be responsible for delivering the sprint results, and who is accountable for those results?

The survey was distributed through online platforms such as LinkedIn and personal outreach via email, and 102 completed responses were received.

The main findings of this study are listed below.

1) The findings revealed that it is necessary to keep the roles of Product Owner and Scrum Master separate because they have distinct responsibilities, risk profiles, and goals. Additionally, the Product Manager and Release Train Engineers have diverse responsibilities and goals to achieve. Combining these roles could lead to difficulties and become unmanageable for a single person. When people are given a job with conflicting tasks, they tend to focus on what is easier and controllable instead of what is most important. The results also indicated that there should be no pay scale difference between the Scrum Master and Product Owner, as well as the Product Manager and Release Train Engineer.
2) According to the findings, the Scrum Master remained solely responsible for facilitating agile rituals, guarding agile principles, providing team leadership, and continuously improving agile teams. While, transparency was shared with the team and performance evaluations with the Product Owner. Furthermore, sharing day-to-day work allocation with the team and communication with end-users among roles while remaining solely responsible for team

leadership led to higher motivation. When there was no difference in pay scale between Scrum Masters and Product Owners, it resulted in higher internal work motivation and satisfaction among Scrum Masters.

3) The study found that the Product Owner remained solely responsible for team backlog, product vision, collaborating with the team, and communicating with end-users. However, delivering the project on time and within budget was a shared responsibility with the team and staffing decisions with another role. Additionally, being accountable for the results of a sprint led to higher team performance, while the team remained responsible for the sprint results. When the Product Owner remained solely responsible for the team backlog but shared the collaboration with stakeholders' responsibility with the team, it led to higher internal work motivation. Furthermore, a pay scale difference of one between the Product Owners and Scrum Masters led to higher internal work motivation and job satisfaction among Product Owners.
4) The findings showed that while the Product Manager remained solely responsible for effective planning, project delivery, product vision delivery, leading through product vision and purpose, collaborating with stakeholders, maximising product value and business affinity, transparency was shared with the RTE and collaboration with team responsibility with the Line Manager. Additionally, remaining solely responsible for project delivery while sharing the product backlog with the RTE, and growing talent and managing compensation responsibilities with the Line Manager, led to higher internal work motivations. Furthermore, a pay scale difference of zero between Product Managers and the Release Train Engineers led to higher motivation and satisfaction for Product Manager, however, this finding is based on only one respondent.
5) The study found that all the responsibilities of the Release Train Engineer (RTE) were shared such as leadership with the Line Manager, facilitating rituals and ensuring agile principles with other roles, and continuous improvement with the Product Manager and Line Manager. When continuous improvement was shared among several roles it resulted in higher internal work motivation among the RTEs. Furthermore, when several roles shared the responsibilities of the product backlog and collaboration with stakeholders, it led to increased motivation. A pay scale difference of one between the RTE and the Product Manager, where the Product Manager receives a higher salary, led to higher motivation and job satisfaction among the RTEs. The study also found that the Release Train Engineers scored the lowest on the job dimensions and outcomes among other roles, indicating that there is still uncertainty about how this role is implemented in practice.
6) According to the study, the Line Manager had the primary responsibility of hiring, training, and keeping competent employees, assessing their performance, and managing their compensation, benefits, and promotions. In addition, when the Product Manager shared the

responsibility of developing and owning the product vision and leading through product vision with the Product Manager, and when different roles shared the day-to-day work allocation, it resulted in high internal motivation among the Line Managers.

The conceptual model successfully diagnosed the existing jobs and related attitudinal and role perception outcomes in practice. The data outlined the different individual responsibilities of the agile roles in practice, strengthening the Framework Guides' definition of these individual roles However, the study also showed that some responsibilities are being shared, and where some of them lead to increased motivation, which predicts quality performance, rather than being an individual responsibility like the framework Guides suggest. Organisations might customise the definition of these roles according to their organisational environment to fit their unique organisational context and the team's needs.

The job design theory was used to get a better understanding of the agile roles in practice, and the findings show that the conceptual model successfully examined the jobs in practice and how this leads to higher motivation and, essentially, better performance, contributing to the empirical knowledge of the relationship between agile roles and the job design theory. For practitioners, the findings provide guidelines on the job requirements of individuals assigned to these roles and, thus, help them configure the roles and their interactions more effectively.

Further Research

One possible avenue for future research would be to expand the study's duration to obtain a larger sample size and collect data from more professionals to get a better sample for Product Managers and Release Train Engineers. Another suggestion is to include social factors (e.g., social support from supervisors and co-workers, feedback from others, interdependence, and interaction outside the organisation) in the model to determine whether they contribute to higher levels of job satisfaction, internal motivation, and role perception. Alternatively, another approach could be to apply a different job design theory or model to get an understanding of these roles in practice.

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Appendix A- Continuing the Job Characteristics of (Morgeson et al., 2006).

Task Variety is related to employees executing many tasks in a job. This is related to job enlargement, which involves performing a variety of tasks to enhance the interest and enjoyment of a job. This feature relates to job satisfaction, performance, and overload.
Job complexity is related to a job that is multifaceted and challenging to perform. The analytic results of this research show that higher complexity is related to higher performance, job satisfaction, and job involvement but also to overload.
Information Processing is how much of a job requires an employee to focus on and manage information. Information processing and monitoring differ across jobs, so knowledge requirements increase when a job requires high information processing. There is little research on the effects of information processing, but the researcher suspects it might lead to job satisfaction, compensation, training, learning and development, and skill requirements.
Specialisation is the extent to which a specialised task is performed or specialised knowledge and expertise is needed to perform a task. Specialisation differs from skill or task variety as those features indicate the span of activities and skills involved in a job. In contrast, specialisation shows the depth of knowledge and expertise required for job completion. There is limited research on the effects of specialisation, but believe it may lead to job satisfaction and efficiency.
Problem Solving is related to the extent to which unique plans or solutions are needed in a job. It is similar to being creative as it reflects dealing with nonroutine problems and correcting errors. Again, there is limited research on this feature, but there is reason to suspect that it leads to both satisfaction and demand for the worker.

Social characteristics arise from the social environment or when working with others. Most researchers have overlooked the social factors, although they have been identified as necessary in work behaviour. There is a limited research study on tasks and roles team members perform (Morgeson et al., 2006, 2008) & (Humphrey et al., 2007). Lately, scholars have observed that social traits play a crucial role in the workplace and cannot be replaced by motivational characteristics. Researchers have observed that the relationships between workers are key in determining the well-being and perceived meaning of work (Morgeson et al., 2008). These traits are believed to mitigate job stress by providing a protective barrier for employees against negative job-related occurrences. Fostering social characteristics in the workplace can lead to improved work motivation and prosocial behaviours. This promotes flexibility, security, and pleasing moods among employees. The rise in popularity of social characteristics may also be linked to the growing use of teams within organisations. Social characteristics are likely to impact a variety of work outcomes. It is believed that social characteristics significantly impact well-being as social interactions can lead to a positive

mood. The desire to establish, engage in and maintain interpersonal relationships is a primary motivation, and such relationships can contribute to improving one's well-being. Studies have shown that any form of social interaction can boost energy, enthusiasm, and overall positive emotions. Therefore, it was predicted that an increase in social aspects of work would improve the well-being of those involved. According to role theory, social interactions can help clarify role perceptions by enhancing one's understanding of one's role through increased contact with others. It is also expected that social characteristics will impact attitudinal outcomes. The literature on well-being has shown that an employee's interactions with others can make their work more satisfying. Furthermore, when individuals interact more with others, either through increased interdependence or interaction outside the organisation, their jobs become more complex and challenging, boosting their motivation. Lastly, the researchers hypothesised that social characteristics would impact behavioural outcomes. Having social characteristics in the workplace allows employees to learn from others (as noted by Morgeson et al., 2008). This means that having more interaction with colleagues in both performance-oriented (where there is interdependence) and non-performance-oriented (where there is social support) contexts, interacting more with people outside the organisation, and receiving direct feedback from others on performance provides employees with the chance to learn how to do their job better by gaining both implicit and explicit knowledge. Moreover, it was anticipated that social traits would lessen absenteeism and turnover rates, given that social interaction can reduce the adverse outcomes linked with work, such as stress and overload, and promote positive emotions among employees. This, in turn, would make them less inclined to miss work and more inclined to continue with their employment at the organisation.

Several work characteristics emerge when working with others (Morgeson et al., 2006, 2008) & (Humphrey et al., 2007).

Starting with *Social Support*, the extent to which there are occasions for help and advice from supervisors and co-workers. This feature is a buffer against negative work outcomes and is associated with several well-being outcomes. Social support is strongly related to organisational commitment, job satisfaction, and turnover intentions. It also negatively relates to role perception outcomes such as role ambiguity and conflict. There is also a slight positive relationship between social support (friendship opportunities at the workplace) and work motivation. The findings imply that social support could be effective in dealing with the challenges that arise from increased job demands, and thus act as a protective measure against negative work outcomes.

Feedback from others is related to where organisation members provide information about job performance. This factor is different from feedback from the job because there are different sources of feedback, as feedback from others arises from the social context (co-workers or supervisors) rather than from the task itself. Accurate and timely feedback from supervisors and co-workers is essential in many organisations because supervisory feedback can help establish and clarify role expectations,

reducing role ambiguity. Well-being, satisfaction, performance, and work motivation are improved when feedback is provided, thus, when there is knowledge of what is expected of oneself. Feedback from others is negatively related to turnover intentions.

Interdependence is multi-faceted and is related to the extent to which workers are connected to others. It consists of three facets: task interdependence (for example, the output of your job can serve as the input for another's job (initiated), or the outputs of another's job can serve as the input for your job (received). Second, the extent to which an individual's goal overlaps with another person's is known as goal interdependence. Lastly, the degree to which a worker's feedback and reward are dependent on another individual is known as outcome interdependence. Interdependence creates a more complex and motivating job by requiring communication between multiple organisational members. If interdependence exists between roles or jobs, workers are often considered a team. Boundary-spanning issues arise when teams or organisations are interdependent, which introduces complex coordination, information sharing, and resource exchange issues. The primary impact of interdependence is on attitudinal outcomes such as satisfaction and organisational commitment. In high-interdependence situations, motivation is increased as it creates competition with out-group members. However, there is also a high level of overload because task interdependence in these high-interdependence situations requires a high level of implicit coordination. Also, task interdependence necessitates more communication between workers where tacit knowledge is transferred, resulting in higher job performance.

Interaction outside the organisation is related to how employees must interact and communicate with people outside the organisation. It differs from other social characteristics, which focus on interaction and information exchange between organisational members within an organisation. This factor represents communication between an organisational member with a non-organizational member involving a broader social environment. For example, sales and service jobs have a high level of interaction outside the organisations because their job demands them to interact with others. There is limited research and knowledge regarding the impact of this factor on outcomes. Some preliminary work shows that it is related to higher job satisfaction and increased compensation requirements.

Contextual characteristics arise from the physical and organisational environment (Morgeson et al., 2006, 2008) & (Humphrey et al., 2007).

Starting with *physical demands,* the extent to which physical activity and effort are involved in a job and a higher level of it is negatively related to satisfaction.

Work conditions are related to components of the work context, such as noise, health hazards, and temperature. This factor is positively related to satisfaction but negatively to stress.

Ergonomics is the extent to which work allows for correct posture and movement, and it is related to both job satisfaction and efficiency.

Equipment use is the perceptual/motor approach of work design and is related to the variety and

complexity of the technology and equipment used in the job. However, research has not shown a consistent impact of equipment use on work outcomes.

It is reasonable to believe that work context characteristics will impact different work outcomes (Morgeson et al., 2006, 2008) & (Humphrey et al., 2007). Specifically, physical demands, work conditions, and ergonomics indicate how the job is designed regarding biological concerns. When physical demands go up and work conditions or ergonomics go down, employees will feel more physically uncomfortable, leading to negative attitudes and lower job satisfaction. Furthermore, if a job is unpleasant and unsatisfying, the employees are more likely to avoid going to work and start searching for alternative job opportunities.

Appendix B- Responsibilities with References

PRODUCT OWNER							
SKILLS / REFERENCES	Scrum Guide	Scaled Agile Framework Guide	Remta, D., & Buchalcevova, A. (2021). Product Owner's Journey to SAFe - Role Changes in Scaled Agile Framework. *Information* , 12, 107.	Kadenic, M.D., de Jesus Pacheco, D.A., Koumaditis, K., Tjornehoj, G., & Tambo, T. (2023). Investigating the role of Product Owner in Scrum teams: Differentiation between organisational and individual impacts and opportunities. *The Journal of Systems and software* , doi: https://doi.org/10.1016/j.jss.2023.111841	Uludag, O., Kleehaus, M., Xu, X., & Matthes, F. (2017). Investigating the Role of Architects in Scaling Agile Frameworks. *Chair for Informatics 19*	Gustavsson, T. (2018). Practices for vertical and horizontal coordination in the Scaled Agile Framework. *27th International Conference of Information Systems Development* , ISD2018 Lund, Sweden.	Sachdeva, S. (2016). Scrum Methodology. *International Journal Of Engineering And Computer Science* , 5 (6), 16792-16799.
Create and own product vision: Work alongside key stakeholders to create a cohesive product or project vision.	x	contribute	x	x	x	x	x
Manage the team backlog: Manage the team backlog and ensure that it is transparent and understandable for everyone to the level needed. Define goals and requirements. I communicate with the product manager (or CPO) to identify and plan program increments and reflect various stakeholders' ideas and requirements.	x	x	x	x	x	x	x
Collaborate with team: Collaborate with the development team to refine and prioritize the requirements into deliverables based on the team's capacity.	x	x	x	x	x	x	x
Technical involvement: The involvement in a project may include designing, implementing, and sharing a reference architecture for large projects, participating in testing activities, ensuring the requirements are met, and managing technical risks. On the business side, the responsibilities may shift towards providing user support, while at the team level, the focus may move beyond coordinating the team to leading the team.		x		x			
The Product Owner requires self-confidence, assertiveness, and impartiality to balance competing viewpoints. The Product Owner must have sensitivity, be able to work in a team, trust the team, and show modesty so that the team can remain self-organized. Additionally, the Product Owner must have an orderly and structured mindset to manage the backlog effectively, which is the key predictor of team efficiency. Strong communication, relationship management, social skills, and trustworthiness are also essential for the Product Owner.			x	x	x	x	x

SCRUM MASTER							
SKILLS / REFERENCES	Scrum Guide	Scaled Agile Framework Guide	Noll, J., Razzak, M. A., Bass, J. M., & Beecham, S. (2017). A study of the Scrum Masters role. *In International Conference on Product-Focused Software Process Improvement* (pp. 307-323). Springer, Cham.	Uludag, O., Kleehaus, M., Xu, X., & Matthes, F. (2017). Investigating the Role of Architects in Scaling Agile Frameworks. *Chair for Informatics 19*	Gustavsson, T. (2018). Practices for vertical and horizontal coordination in the Scaled Agile Framework. *27th International Conference of Information Systems Development* , ISD2018 Lund, Sweden.	Bass, J.M. (2014). Scrum Master Activities: Process Tailoring in Large Enterprise Projects. *Proceedings of the 2014 IEEE 9th International Conference on Global Software Engineering* , 18-21, 6-15.	Sachdeva, S. (2016). Scrum Methodology. *International Journal Of Engineering And Computer Science* , 5 (6), 16792-16799.
Team leadership: Ability to build a high-performing team. Lead and coach team members through all sprints/iterations and phases of the project using the Agile/Scrum process. Strong empathic skills to create a collaborative atmosphere.	x	x	x	x	x	x	x
Facilitation of rituals: Organize and facilitate daily stand-ups, reviews, retrospectives, sprint/release planning, demos, and other Scrum-related meetings so that they are effective.	x	x	x	x	x	x	x
Guard agile principles: I ensure that the development teams are practicing core agile processes, principles, and rules.	x	x	x	x	x	x	x
Continous improvement: I spend time investigating and removing impediments for the development team.	x	x	x	x	x	x	x
Transparency: I inform the Product Owner and other stakeholders of the current status of development work. I use various tools and other information radiators to visualize progress, relevant metrics and ensure a smooth flow of value.	x	x	x			x	
Ensure that project is delivered on time and budget							
Allocate day-to-day responsibilities in team							
Evaluate performance of individuals in project team							

TEAM MEMBER				
SKILLS / REFERENCES	Scrum Guide	Scaled Agile Framework Guide	Tripp, J.F., Riemenschneider, C., & Thatcher, J.B. (2016). Job Satisfaction in Agile Development Teams: Agile Development as Work Redesign. *Journal of the Association for Information Systems* , DOI: 10.17705/1jais.00426, 1536-9323	Sachdeva, S. (2016). Scrum Methodology. *International Journal Of Engineering And Computer Science* , 5 (6), 16792-16799.
planning their own work	x	x	x	x
Delivery of value	x	x	x	x
defining, building, and testing their stories	x	x	x	x
Daily stand-up meeting: Depending on the agile method in use, during the daily stand-up meeting, each team member has to answer a predefined list of questions. The ADT as a whole performs this practice each day.	x	x	x	x
Iterative delivery (Release planning, Iteration planning, Velocity): This approach allows the team to receive immediate feedback from the environment after each iteration, enabling them to generate code more effectively. As the team delivers several iterations, its velocity emerges, which measures the amount of work it can complete per iteration.	x	x	x	x
Retrospectives: During these meetings, ADT members reflect on their work and suggest or adopt modifications for the next cycle.	x	x	x	x
Burndown: It compares the amount of work planned with the amount of work completed, giving the entire Agile Development Team (ADT) a clear idea of their progress towards the team's goal. Through this chart, each team member can identify areas where more effort is required to keep the project on track.		x	x	

PRODUCT MANAGER				
SKILLS / REFERENCES	Scaled Agile Framework Guide	Maglyas, A., Nikula, U., & Smolander, K. (2013). What Are the Roles of Software Product Managers? An Empirical Investigation. *Journal of systems and software* .	Tkalich, A., Ulfsnes, R., & Moe, N.B. (2022). Toward an Agile Product Management: What Do Product Managers Do in Agile Companies? *Agile Processes in Software Engineering and Extreme Programming* , pp. 168-184	Remta, D., & Buchalcevova, A. (2021). Product Owner's Journey to SAFe - Role Changes in Scaled Agile Framework. *Information* , 12, 107.
Create and own product vision: Work alongside key stakeholders to create a cohesive product or project vision. responsible for product strategy and vision, roadmap planning, pricing, release planning, product development, and prioritizing the cross-team (ART, Tribe) backlog.	x	x	x	x
Lead through product vision and purpose: Work alongside product owner and stakeholders	x	x	x	x
Manage the team backlog: Manage the team backlog and ensure that it is transparent and understandable for everyone to the level needed. Define goals and requirements. I collaborate with various stakeholders, including product management, business owners, and product owners, to ensure the backlog aligns with strategy. manage all aspects of in-life products, including customer feedback, requirements, and issues.	x	x	x	x
Collaborate with team: Collaborate with the development team to refine and prioritize the requirements into deliverables based on the team's capacity.				
Collaborate with stakeholders: I contribute and collaborate closely with many stakeholders, i.e., Product Manager, Release Train Engineer, System Team, Business Owners, and other Product Owners to maximize the product's value.	x	x	x	x
ize value: Collaborate with product owners and customers to optimize product value.	x	x	x	x
ss affinity: Ability to translate business needs to technical language.	x	x	x	x
Transparency: Ability to provide insight to stakeholders on the product and market. Ability to inform stakeholders of the current status of development work. I use various tools and other information radiators to visualize progress, relevant metrics and ensure a smooth flow of value.	x			

Release Train Engineer			
REFERENCES SKILLS	Scaled Agile Framework Guide	Uludag, O., Kleehaus, M., Xu, X., & Matthes, F. (2017). Investigating the Role of Architects in Scaling Agile Frameworks. *Chair for Informatics 19*	Gustavsson, T. (2018). Practices for vertical and horizontal coordination in the Scaled Agile Framework. *27th International Conference of Information Systems Development* , ISD2018 Lund, Sweden.
Leadership: Ability to build a high perfomrning team-of-teams (e.g., ART, Tribe). Leader of leaders. Coach and encourage leaders, business owners, teams, and scrum masters to use SAFe practices and methods. Strong empathic skills to create a collaborative atmosphere.	**x**	**x**	**x**
Facilitation of rituals: Organize and facilitate *daily stand-ups, reviews, retrospectives, sprint/release planning, demos, and other Scrum-related meetings* so that they are effective.	**x**	**x**	**x**
Guard agile principles: Able ensure that the development teams are practicing core agile principles, and rules.	**x**		
Continous improvement: Ability to investigate and remove impediments for the development teams. Ability to work alongside key stakeholders to define and implement new product development processes and facilitate the continuous improvement of existing processes to help teams increase productivity.	**x**	**x**	**x**
Transparency: Ability to provide insight to stakeholders on the product and market. Ability to inform stakeholders of the current status of development work. I use various tools and other information radiators to visualize progress, relevant metrics and ensure a smooth flow of value.	**x**		
Delivery: Good grasp of planning, risk management and program management level skills. Ability to assist in the management of risks, dependencies, and roadblocks.	**x**	**x**	**x**
Ensure that project is delivered on time and budget			
Allocate day-to-day responsibilities in team			
Evaluate performance of individuals in project team			

LINE MANAGER				
REFERENCES SKILLS	Ljung, A., & Udesen, J. (2019). The role of the first line manager in a Scaled Agile organization. A Case Study at Volvo Cars Corporation. *Master's Thesis in the Management and Economics of Innovation Master's Programme.*	Op de Beeck, S., Wynen, J., & Hondeghem, A. (2015). Effective HRM Implementation by Line Managers: Relying on Various Sources of Support. *International journal of public administration* , 40, 192-204.	Bos-Nehles, A., van Riemsdijk M.J., & Looise J.K. (2013). Employee perceptions of Line management performance: applying the AMO theory to explain the effectiveness of line managers' HRM implementation. *Human Resource Management* , 52 (6), 1-17.	Purcell, J., & Hutchinson, S. (2007). Front-line managers as agents in the HRM performance causal chain: theory, analysis and evidence. *Human Resource Management Journal* , 17 (1), 3–20.
I am responsible for recruiting, developing, and retaining capable individuals.	x	x	x	x
I evaluate performance, including team input, and provide feedback, guidance, and corrective actions.	x	x	x	x
I am responsible for compensation, benefits, training processes and promotions.	x	x	x	x

Appendix C- Definition of the Responsibilities

Responsibilities	Scrum Master	Product Owner	Team Member	Other	Variance	Standard Deviation
Team leadership: Ability to build a high performing team. Lead and coach team members through all sprints/iterations and phases of the project using the Agile/Scrum process. Strong empathic skills to create a collaborative atmosphere.	52,35% (N=78)	25,50% (N=38)	11,41% (N=17)	10.74% (N=16)	0,873	0,934
Facilitation of rituals: Organize and facilitate daily stand-ups, reviews, retrospectives, sprint/release planning, demos, and other Scrum-related meetings so that they are effective.	68,66% (N=92)	14,93% (N=20)	14,18% (N=19)	2,24% (N=3)	0,673	0,820
Guard agile principles: Ensure that the development teams are practising core agile processes, principles, and rules.	69,01% (N=98)	14,08% (N=20)	13,38% (N=19)	3,52% (N=5)	0,734	0,857
Continuous improvement: Investigate and remove impediments for the development team.	47,09% (N=81)	25,58% (N=44)	22,09% (N=38)	5,23% (N=9)	0,885	0,941
Transparency: Inform the Product Owner and other stakeholders of the current status of development work. Use various tools and other information radiators to visualise progress, relevant metrics and ensure a smooth flow of value.	42,77% (N=71)	10,84% (N=18)	40,36% (N=67)	6,02% (N=10)	1,069	1,034
Delivery responsibility: Ensure that project is delivered on time and budget	18,18% (N=30)	44,85% (N=74)	30,30% (N=50)	6,67% (N=11)	0,688	0,829

Day-to-day work allocation: Allocate day-to-day responsibilities in team	26,52% (N=35)	19,70% (N=26)	50,00% (N=66)	3,79% (N=5)	0,826	0,909
Create and own product vision: Work alongside key stakeholders to create a cohesive product or project vision.	3,25% (N=4)	76,42% (N=94)	11,38% (N=14)	8,94% (N=11)	0,440	0,663
Manage the team backlog: Manage the team backlog and ensure it is transparent and understandable for everyone to the level needed. Define goals and requirements. Communicate with the product manager (or CPO) to identify and plan program increments and reflect various stakeholders' ideas and requirements.	19,29% (N=27)	62,14% (N=87)	15,71% (N=22)	2,86% (N=4)	0,467	0,683
Collaborate with team: Collaborate with the development team to refine and prioritise the requirements into deliverables based on the team's capacity.	24,00% (N=42)	50,86% (N=89)	20,57% (N=36)	4,57% (N=8)	0,628	0,792
Collaborate with stakeholders: Contribute and collaborate closely with many stakeholders, i.e., Product Manager, Release Train Engineer, System Team, Business Owners, and other Product Owners to maximise the product's value.	18,59% (N=29)	58,97% (N=92)	17,95% (N=28)	4,49% (N=7)	0,523	0,723

Evaluate performance: Evaluate the performance of individuals in the project team. Including team input, and provide feedback, guidance, and corrective actions.	31,98% (N=55)	29,07% (N=50)	19,19% (N=33)	19,77% (N=34)	1,238	1,113
Communicate with end-user (I.e., internal client in business unit)	11,04% (N=18)	53,99% (N=88)	28,83% (N=47)	6,13% (N=10)	0,557	0,746
Develop the solution	6,67% (N=8)	11,67% (N=14)	77,50% (N=93)	4,17% (N=5)	0,385	0,620
Staffing decisions	24,45% (N=33)	30,61% (N=45)	8,16% (N=12)	38,78% (N=57)	1,467	1,211

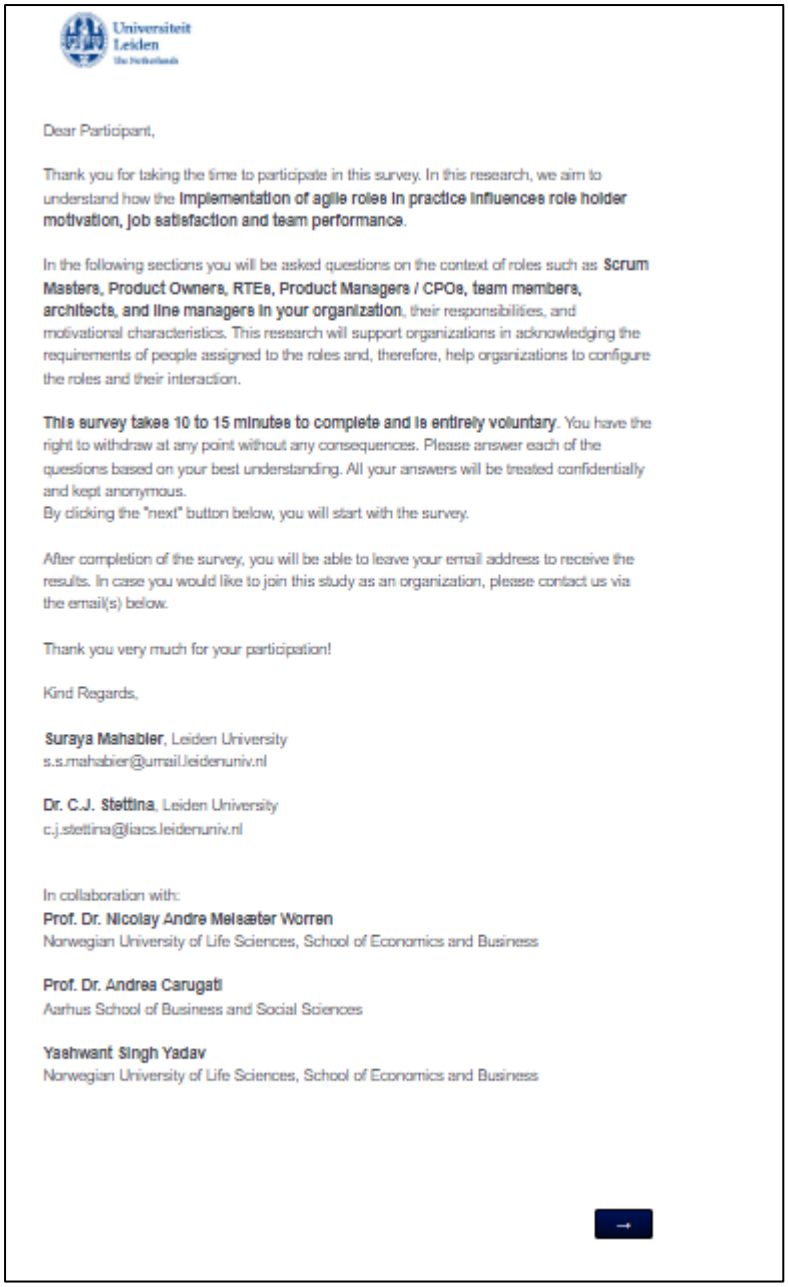
Responsibilities	Release Train Engineer	Product Manager/ CPO	Line Manager	Other	Variance	Standard Deviation
Leadership: Ability to build a high-performing team of teams (e.g., ART, Tribe). Leader of leaders. Coach and encourage leaders, business owners, teams, and scrum masters to use SAFe practices and methods. Strong empathic skills to create a collaborative atmosphere.	37,84% (N=42)	19,82% (N=22)	36,04% (N=40)	6,31% (N=7)	0,988	0.994
Facilitation of rituals: Organize and facilitate daily stand-ups, reviews, retrospectives, sprint/release planning, demos, and other Scrum-related meetings so that they are effective.	41,05% (N=39)	16,84% (N=16)	11,58% (N=11)	30,53% (N=29)	1,665	1,290
Guard agile principles: Able to ensure that the development teams practice core agile principles and rules.	48,45% (N=47)	13,40% (N=13)	16,49% (N=16)	21,65% (N=21)	1,518	1,232
Continuous improvement: Ability to investigate and remove impediments for the development teams. Ability to work alongside key stakeholders to define and implement new product development processes and facilitate the continuous improvement of existing processes to help teams increase productivity.	34,78% (N=48)	28,26% (N=39)	24,64% (N=34)	12,32% (N=17)	1,074	1,036

Transparency: Ability to provide insight to stakeholders on the product and market. Ability to inform stakeholders of the current status of development work. I use various tools and other information radiators to visualize progress-relevant metrics and ensure a smooth flow of value.	31,54% (N=41)	43,08% (N=56)	17,69% (N=23)	7,69% (N=10)	0,806	0,898
Planning: Good grasp of planning, risk management, and program management skills. Ability to assist in the management of risks, dependencies, and roadblocks.	28,24% (N=37)	41,22% (N=54)	18,32% (N=24)	12,21% (N=16)	0,940	0,970
Delivery responsibility: Ensure the project is delivered on time and within budget.	19,49% (N=23)	50,00% (N=59)	17,80% (N=21)	12,71% (N=15)	0,832	0,912
Day to day work allocation: Allocate day-to-day responsibilities in the team.	25,74% (N=26)	18,81% (N=19)	20,79% (N=21)	34,65% (N=35)	1,452	1,205
Create and own product vision: Work alongside key stakeholders to create a cohesive product or project vision. responsible for product strategy and vision, roadmap planning, pricing, release planning, product development, and prioritizing the cross-team (ART, Tribe) backlog.	4,76% (N=5)	72,38% (N=76)	18,10% (N=19)	4,76% (N=5)	0,370	0,609
Lead through product vision and purpose: Work alongside PO and stakeholders.	8,18% (N=9)	62,73% (N=69)	23,64% (N=26)	5,45% (N=6)	0,471	0,686

Manage the team backlog: Manage the team backlog and ensure it is transparent and understandable for everyone to the level needed. Define goals and requirements. I collaborate with various stakeholders, including product management, business owners, and product owners, to ensure the backlog aligns with strategy. manage all aspects of in-life products, including customer feedback, requirements, and issues.	11,43% (N=12)	58,10% (N=61)	10,48% (N=11)	20,00% (N=21)	0,875	0,935
Collaborate with team: Collaborate with the development team to refine and prioritize the requirements into deliverables based on the team's capacity.	21,13% (N=30)	40,14% (N=57)	20,42% (N=29)	18,31% (N=26)	1,026	1,013
Collaborate with stakeholders: Contribute and collaborate closely with many stakeholders, i.e., Product Manager, Release Train Engineer, System Team, Business Owners, and other Product Owners to maximize the product's value.	16,03% (N=21)	54,20% (N=71)	22,14% (N=29)	7,63% (N=10)	0,646	0,804
Maximize value: Collaborate with product owners and customers to optimize product value.	13,45% (N=16)	63,03% (N=75)	15,97% (N=19)	7,56% (N=9)	0,570	0,755
Business affinity: Ability to translate business needs to technical language.	10,43% (N=12)	53,91% (N=62)	16,52% (N=19)	19,13% (N=22)	0,845	0,919
Grow talent: Responsible for recruiting, developing, and retaining capable individuals.	16,96% (N=19)	15,18% (N=17)	58,93% (N=66)	8,93% (N=10)	0,765	0,875

Evaluate performance: Evaluate the performance of individuals in the project team. Including team input, and provide feedback, guidance, and corrective actions.	17,78% (N=24)	21,48% (N=29)	48,89% (N=66)	11,85% (N=16)	0,847	0,920
Compensation management: Responsible for compensation, benefits, and promotions.	6,59% (N=6)	7,69% (N=7)	73,63% (N=67)	12,09% (N=11)	0,459	0,677

Appendix D- Survey Design



Universiteit Leiden
The Netherlands

Dear Participant,

Thank you for taking the time to participate in this survey. In this research, we aim to understand how the **implementation of agile roles in practice influences role holder motivation, job satisfaction and team performance**.

In the following sections you will be asked questions on the context of roles such as **Scrum Masters, Product Owners, RTEs, Product Managers / CPOs, team members, architects, and line managers in your organization**, their responsibilities, and motivational characteristics. This research will support organizations in acknowledging the requirements of people assigned to the roles and, therefore, help organizations to configure the roles and their interaction.

This survey takes 10 to 15 minutes to complete and is entirely voluntary. You have the right to withdraw at any point without any consequences. Please answer each of the questions based on your best understanding. All your answers will be treated confidentially and kept anonymous.
By clicking the "next" button below, you will start with the survey.

After completion of the survey, you will be able to leave your email address to receive the results. In case you would like to join this study as an organization, please contact us via the email(s) below.

Thank you very much for your participation!

Kind Regards,

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→

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Agile Background & Experience:
The following questions are about the role you are currently in, your experience within that role and agile methods in general.

If you are currently not occupying one of these roles, but recently have, please answer these questions based on your most recent experience.

In these questions we make a distinction between a role and a position. A **position** is the formal appointment you have been hired for as per your contract, while a **role** refers to what you assume as part of that position. A Scrum Master can be a formal position within a company, but it can be also a role assumed (e.g., an engineer fulfilling the role of a Scrum Master).

What is your current role?

What is the exact/formal name of the position in your organization.

Please indicate your level of allocation to the role. (100% = Full time allocation, <100% = Part time allocation to role, potentially executed alongside another role e.g., 50% Scrum Master, 50% engineer)

10 20 30 40 50 60 70 80 90 100

Allocation to your current role (%)

Are you occupying another role in your position? If yes, please indicate the role.

Please specify your experience in the following role(s) in number of years.
If you have occupied multiple of those roles, please fill in the numbers for multiple roles.

Scrum Master	
Product Owner	
Team Member (code, design, etc.)	
Product Manager/Chief Product Owner	
Release Train Engineer	
System Architect	
Line Manager / Group lead	
Other, please specify:	

How much experience do you have with the following agile frameworks? Please add the experience you have had with those frameworks in numbers of years.

Scrum	
SAFe (Scaled Agile Framework)	
Kanban	
Spotify Model	
LeSS (Large Scale Scrum)	
XP (Extreme Programming)	
DA (Disciplined Agile)	
Scrum of Scrums	
Other, please specify:	

What is the number of employees in your organization (company) that works following an agile framework (e.g. Scrum, SAFe)

10-250	251-1000	1001-5000	5001-20000	20001-50000	> 50001

← →

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The following section is related to the responsibilities of roles in your organization.
Please fill in the questions from the perspective of your role.

If you had one choice, who in your organization has the **responsibility** for delivering the **results** of a **team Sprint/Iteration**?
(Who is responsible for the delivery of the work?)

Scrum Master	Product Owner	Team	Other role(s)

If you had one choice, who in your organization has the **formal accountability** for the **results** of a **team Sprint/Iteration**?
(Who is approving/accepting the delivered work?)

Scrum Master	Product Owner	Team	Other role(s)

If you had one choice, who in your organization has the **final responsibility** for **hiring and staffing** team members within the development teams?

Scrum Master	Product Owner	Line management / Group lead	Other role(s)

What, in your opinion, if any, is the degree of **conflict of goals across the Product Owner and Scrum Master** roles?
Or to put differently: What is the extent to which the main goals of the two roles are conflicting?

High conflict could indicate an opportunity to separate the responsibilities into multiple roles.

Low	Medium	High

What, in your opinion, is the degree of **task interdependency across the Product Owner and Scrum Master** roles? Or to put differently: What is the extent to which the tasks of the two roles are intertwined?

Highly intertwined tasks could indicate an opportunity to integrate those tasks into one role.

Low	Medium	High

The following statements relate to the work you do with your team.

- If you are a **Scrum Master, Product Owner, or team member**, please answer the questions directly for the team.
- If you are a **Release Train Engineer (RTE) or Product Manager/Chief Product Owner (PM/CPO)**, please answer the questions from a team-of-teams perspective (e.g., ART, Tribe).
- If you are a **line manager** with your staff being in multiple agile teams, please answer the questions from the perspective of the most mature agile team your staff works with.

How much do you agree with each statement?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Going by the results, this teamwork can be regarded as successful.	○	○	○	○	○
2. All demands of the customers are satisfied.	○	○	○	○	○
3. From the company's perspective, all team goals are achieved.	○	○	○	○	○
4. The performance of the team advances our image to the customer.	○	○	○	○	○
5. The teamwork result is of high quality.	○	○	○	○	○

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6. The customer is satisfied with the quality of the teamwork result.	○	○	○	○	○
7. The team is satisfied with the teamwork result.	○	○	○	○	○
8. The product produced in the team, requires little rework.	○	○	○	○	○
9. The product proves to be stable in operation.	○	○	○	○	○
10. The product proves to be robust in operation.	○	○	○	○	○

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
11. The company is satisfied with how the teamwork progresses.	○	○	○	○	○
12. Overall, the team works in a cost-efficient way.	○	○	○	○	○
13. Overall, the team works in a time-efficient way.	○	○	○	○	○
14. The team is within schedule.	○	○	○	○	○
15. The team is within budget.	○	○	○	○	○

Please indicate the distribution of responsibilities across the following roles in your organization.

Please fill in for the responsibilities you are aware of and feel comfortable to fill it in across the roles. If you are unaware of the responsibility and it's distribution, please leave it out.

	Scrum Master	Product Owner	Team Member	Other
Team leadership: Ability to build a high performing team. Lead and coach team members through all sprints/iterations and phases of the project using the Agile/Scrum process. Strong empathic skills to create a collaborative atmosphere.	☐	☐	☐	☐
Facilitation of rituals: Organize and facilitate daily stand-ups, reviews, retrospectives, sprint/release planning, demos, and other Scrum-related meetings so that they are effective.	☐	☐	☐	☐
Guard agile principles: Ensure that the development teams are practicing core agile processes, principles, and rules.	☐	☐	☐	☐

Continuous improvement: Investigate and remove impediments for the development team.	☐	☐	☐	☐
Transparency: Inform the Product Owner and other stakeholders of the current status of development work. Use various tools and other information radiators to visualize progress, relevant metrics and ensure a smooth flow of value.	☐	☐	☐	☐
	Scrum Master	Product Owner	Team Member	Other
Delivery responsibility: Ensure that project is delivered on time and budget	☐	☐	☐	☐
Day to day work allocation: Allocate day-to-day responsibilities in team	☐	☐	☐	☐
Create and own product vision: Work alongside key stakeholders to create a cohesive product or project vision.	☐	☐	☐	☐

Manage the team backlog: Manage the team backlog and ensure it is transparent and understandable for everyone to the level needed. Define goals and requirements. Communicate with the product manager (or CPO) to identify and plan program increments and reflect various stakeholders' ideas and requirements.	☐	☐	☐	☐
Collaborate with team: Collaborate with the development team to refine and prioritize the requirements into deliverables based on the team's capacity.	☐	☐	☐	☐
	Scrum Master	Product Owner	Team Member	Other
Collaborate with stakeholders: Contribute and collaborate closely with many stakeholders, i.e., Product Manager, Release Train Engineer, System Team, Business Owners, and other Product Owners to maximize the product's value.	☐	☐	☐	☐

Evaluate performance: Evaluate the performance of individuals in the project team. Including team input, and provide feedback, guidance, and corrective actions.	☐	☐	☐	☐
Communicate with end-user (I.e., internal client in business unit)	☐	☐	☐	☐
Develop the solution	☐	☐	☐	☐
Staffing decisions	☐	☐	☐	☐

Please indicate the distribution of responsibilities across the following roles in your organization.

Please fill in for the responsibilities you are aware of and feel comfortable to fill it in across the roles. If you are unaware of the responsibility and it's distribution, please leave it out.

	Release Train Engineer	Product Manager/CPO	Line Manager	Other roles
Leadership: Ability to build a high-performing team-of-teams (e.g., ART, Tribe). Leader of leaders. Coach and encourage leaders, business owners, teams, and scrum masters to use SAFe practices and methods. Strong empathic skills to create a collaborative atmosphere.	☐	☐	☐	☐
Facilitation of rituals: Organize and facilitate daily stand-ups, reviews, retrospectives, sprint/release planning, demos, and other Scrum-related meetings so that they are effective.	☐	☐	☐	☐
Guard agile principles: Able to ensure that the development teams practice core agile principles and rules.	☐	☐	☐	☐

Continuous improvement: Ability to investigate and remove impediments for the development teams. Ability to work alongside key stakeholders to define and implement new product development processes and facilitate the continuous improvement of existing processes to help teams increase productivity.	☐	☐	☐	☐
Transparency: Ability to provide insight to stakeholders on the product and market. Ability to inform stakeholders of the current status of development work. I use various tools and other information radiators to visualize progress-relevant metrics and ensure a smooth flow of value.	☐	☐	☐	☐
Planning: Good grasp of planning, risk management, and program management skills. Ability to assist in the management of risks, dependencies, and roadblocks.	☐	☐	☐	☐

	Release Train Engineer	Product Manager/CPO	Line Manager	Other roles
Delivery responsibility: Ensure the project is delivered on time and within budget.	☐	☐	☐	☐
Day to day work allocation: Allocate day-to-day responsibilities in the team.	☐	☐	☐	☐
Create and own product vision: Work alongside key stakeholders to create a cohesive product or project vision. responsible for product strategy and vision, roadmap planning, pricing, release planning, product development, and prioritizing the cross-team (ART, Tribe) backlog.	☐	☐	☐	☐
Lead through product vision and purpose: Work alongside PO and stakeholders.	☐	☐	☐	☐

Manage the team backlog: Manage the team backlog and ensure it is transparent and understandable for everyone to the level needed. Define goals and requirements. I collaborate with various stakeholders, including product management, business owners, and product owners, to ensure the backlog aligns with strategy. manage all aspects of in-life products, including customer feedback, requirements, and issues.	☐	☐	☐	☐
Collaborate with team: Collaborate with the development team to refine and prioritize the requirements into deliverables based on the team's capacity.	☐	☐	☐	☐

	Release Train Engineer	Product Manager/CPO	Line Manager	Other roles
Collaborate with stakeholders: Contribute and collaborate closely with many stakeholders, i.e., Product Manager, Release Train Engineer, System Team, Business Owners, and other Product Owners to maximize the product's value.	☐	☐	☐	☐
Maximize value: Collaborate with product owners and customers to optimize product value.	☐	☐	☐	☐
Business affinity: Ability to translate business needs to technical language.	☐	☐	☐	☐
Grow talent: Responsible for recruiting, developing, and retaining capable individuals.	☐	☐	☐	☐

Evaluate performance: Evaluate the performance of individuals in the project team. Including team input, and provide feedback, guidance, and corrective actions.	☐	☐	☐	☐
Compensation management: Responsible for compensation, benefits, and promotions.	☐	☐	☐	☐

Other, Please specify

With the following question we would like to understand the relationship between job grades among agile roles in your organization. Please fill in only for the roles you know and where you feel comfortable filling in the information.

The pay scale numbers are meant as an example, and while the numbers do not need to be accurate, we would like to understand the differences across the roles in particular (e.g., RTE vs. SM, SM vs. PO).

Could you specify, to the best of your knowledge, the job / pay grade range for the following roles in your organization? (pay grade is based on annual gross salary, excluding any benefits)

	Pay Scale									
	Pay Grade 1 €40k – €50k	Pay Grade 2 €50k – €60k	Pay Grade 3 €60k – €70k	Pay Grade 4 €70k – €80k	Pay Grade 5 €80k – €90k	Pay Grade 6 €90k– €100k	Pay Grade 7 €100k- €110k	Pay Grade 8 €110k- €120k	Pay Grade 9+ €120k- €130k+	Don't Know
Scrum Master	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Product Owner	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Product Manager/Chief product owner	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Line Manager/Group Lead	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Release Train Engineer	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Team Member (Code, Design, etc.)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
System Architect	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

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The following section will cover the job/task characteristics of your role.
It is important as these characteristics lead to the satisfaction and motivation of employees.

Please answer those questions from the perspective of your role, which you indicated at the beginning of this survey.

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With the following statements, we would like to understand your ability to control your work time, known as *work scheduling autonomy*.

	Strongly Disagree	DIsagree	Neutral	Agree	Strongly Agree
1. The job allows me to make my own decisions about how to schedule my work.	○	○	○	○	○
2. The job allows me to decide on the order in which things are done on the job.	○	○	○	○	○
3. The job allows me to plan how I do my work.	○	○	○	○	○

With the following statements, we would like to understand your ability to make your own decisions at work, known as *decision-making autonomy*.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. The job gives me a chance to use my personal initiative or judgment in carrying out the work.	○	○	○	○	○
2. The job allows me to make a lot of decisions on my own.	○	○	○	○	○
3. The job provides me with significant autonomy in making decisions.	○	○	○	○	○

With the following statements, we would like to understand your ability to control how you perform your work, known as *work methods autonomy*.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. The job allows me to make decisions about what methods I use to complete my work.	○	○	○	○	○
2. The job gives me considerable opportunity for independence and freedom in how I do the work.	○	○	○	○	○
3. The job allows me to decide on my own how to go about doing my work.	○	○	○	○	○

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With the following statements, we would like to understand if your task has an impact on the lives of others inside and outside the organization, known as *Task Significance*.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. The results of my work are likely to significantly affect the lives of other people.	○	○	○	○	○
2. The job itself is very significant and important in the broader scheme of things.	○	○	○	○	○
3. The job has a large impact on people outside the organization.	○	○	○	○	○
4. The work performed on the job has a significant impact on people outside the organization.	○	○	○	○	○

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With the following statements, we would like to understand to which extent you can complete an entire work, known as *Task Identity*.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. The job involves completing a piece of work that has an obvious beginning and end.	○	○	○	○	○
2. The job is arranged so that I can do an entire piece of work from beginning to end.	○	○	○	○	○
3. The job provides me the chance to completely finish the pieces of work I begin.	○	○	○	○	○
4. The job allows me to complete the work I start.	○	○	○	○	○

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With the following statements, we would like to understand the extent of various skills you need to perform on your job, known as *Skill Variety*.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. The job requires a variety of skills.	○	○	○	○	○
2. The job requires me to utilize a variety of different skills in order to complete the work.	○	○	○	○	○
3. The job requires me to use a number of complex or high-level skills.	○	○	○	○	○
4. The job requires the use of a number of skills.	○	○	○	○	○

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With the following statements, we would like to understand if your job provides timely and accurate feedback or information about your performance, known as *Feedback From Job*.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. The work activities provide direct and clear information about my job performance's effectiveness (e.g., quality and quantity).	○	○	○	○	○
2. The job itself provides feedback on my performance.	○	○	○	○	○
3. The job itself provides me with information about my performance.	○	○	○	○	○

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With the following statements, we would like to understand your satisfaction level in your agile role.

How satisfied are you with this (each) aspect of your job?

	Extremely Dissatisfied	Dissatisfied	Slightly Dissatisfied	Neutral	Slightly Satisfied	Satisfied	Extremely Satisfied
1. The amount of job security I have.	○	○	○	○	○	○	○
2. The amount of pay and fringe benefits I receive.	○	○	○	○	○	○	○
3. The amount of personal growth and development I get in doing my job.	○	○	○	○	○	○	○
4. The people I talk to and work with on my job.	○	○	○	○	○	○	○
5. The degree of respect and fair treatment I receive from my boss.	○	○	○	○	○	○	○

	Extremely Dissatisfied	Dissatisfied	Slightly Dissatisfied	Neutral	Slightly Satisfied	Satisfied	Extremely Satisfied
6. The feeling of worthwhile accomplishment I get from doing my job.	○	○	○	○	○	○	○
7. The chance to get to know other people while on the job.	○	○	○	○	○	○	○
8. The amount of support and guidance I receive from my supervisor.	○	○	○	○	○	○	○
9. The degree to which I am fairly paid for what I contribute to this organization.	○	○	○	○	○	○	○
10. The amount of independent thought and action I can exercise in my Job.	○	○	○	○	○	○	○

	Extremely Dissatisfied	Dissatisfied	Slightly Dissatisfied	Neutral	Slightly Satisfied	Satisfied	Extremely Satisfied
11. How secure things look for me in the future in this organization.	○	○	○	○	○	○	○
12. The chance to help other people while at work.	○	○	○	○	○	○	○
13. The amount of challenge in my job.	○	○	○	○	○	○	○
14. The overall quality of the supervision I receive in my work.	○	○	○	○	○	○	○

With the following statements, we would like to understand your motivation level in your agile role.
How much do you agree with the statement?

	Disagree Strongly	Disagree	Disagree Slightly	Neutral	Agree Slightly	Agree	Agree Strongly
1. My opinion of myself goes up when I do this job well.	○	○	○	○	○	○	○
2. I feel a great sense of personal satisfaction when I do this job well.	○	○	○	○	○	○	○
3. I feel bad and unhappy when I discover that I have performed poorly on this job.	○	○	○	○	○	○	○
4. My own feelings generally are not affected much one way or the other by how well I do on this job.	○	○	○	○	○	○	○

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With the following conditions, we would like to understand if there are clarity and correct expectations associated with your agile role.

Please indicate the degree to which these conditions exist for you.

	Very False	False	Slightly False	Neutral	Slightly True	True	Very True
1. I have to do things that should be done differently.	○	○	○	○	○	○	○
2. I receive an assignment without the manpower to carry out an assignment.	○	○	○	○	○	○	○
3. I have to buck a rule or policy in order to carry out an assignment.	○	○	○	○	○	○	○
4. I work with two or more groups who operate quite differently.	○	○	○	○	○	○	○
5. I receive incompatible requests from two or more people.	○	○	○	○	○	○	○

	Very False	False	Slightly False	Neutral	Slightly True	True	Very True
6. I do things that are apt to be accepted by one person and not accepted by others.	○	○	○	○	○	○	○
7. I receive an assignment without adequate resources and materials to execute it.	○	○	○	○	○	○	○
8. I work on unnecessary things.	○	○	○	○	○	○	○
9. I feel certain about how much authority I have.	○	○	○	○	○	○	○
10. I have clear, planned goals and objectives for my job.	○	○	○	○	○	○	○

	Very False	False	Slightly False	Neutral	Slightly True	True	Very True
11. I know that I have divided my time properly.	○	○	○	○	○	○	○
12. I know what my responsibilities are.	○	○	○	○	○	○	○
13. I know what exactly is expected of me.	○	○	○	○	○	○	○
14. Explanation is clear of what has to be done.	○	○	○	○	○	○	○

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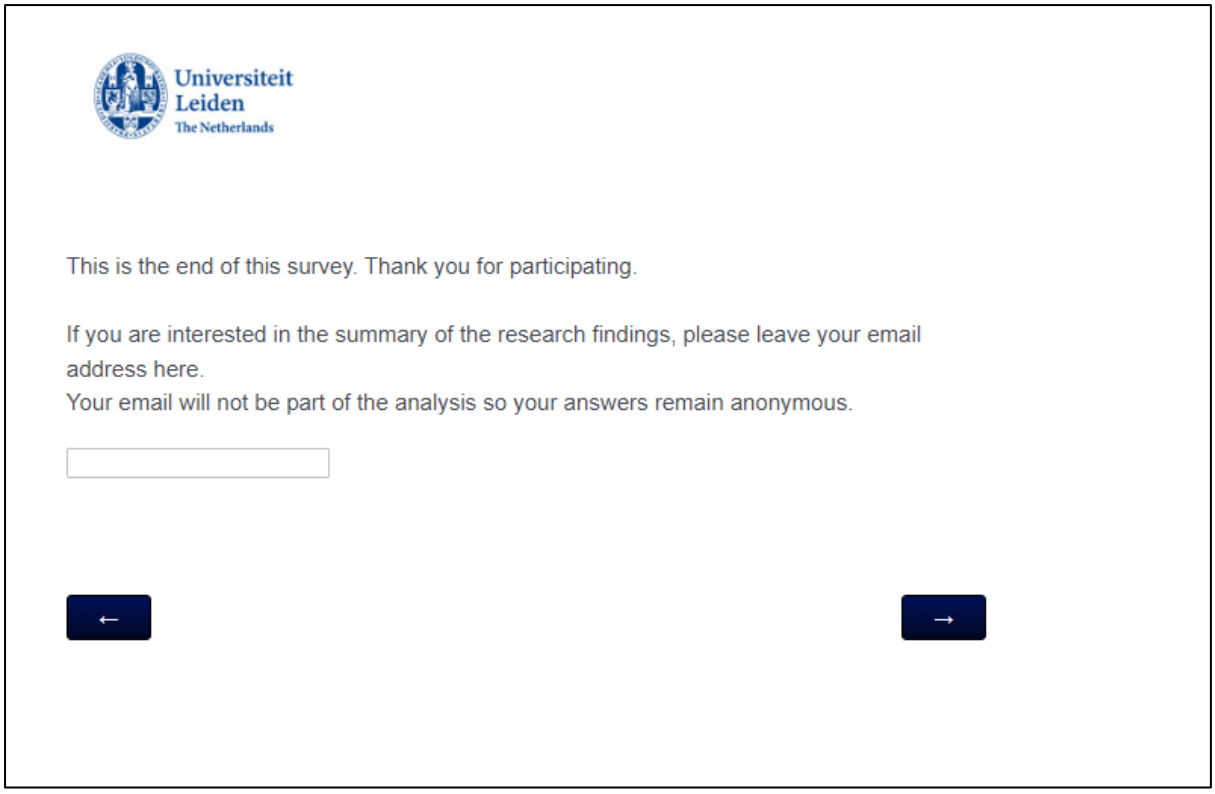
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This is the end of this survey. Thank you for participating.
If you are interested in the summary of the research findings, please leave your email address here.
Your email will not be part of the analysis so your answers remain anonymous.
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